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Cooperative ECONOMIC INSECT REPORT

INSECTS NOT KNOWN
To Occur In The United States

Issued by

PLANT PEST CONTROL DIVISION

AGRICULTURAL RESEARCH SERVICE

UNITED STATES DEPARTMENT OF AGRICULTURE

AGRICULTURAL RESEARCH SERVICE

PLANT PEST CONTROL DIVISION

SURVEY AND DETECTION OPERATIONS

The Cooperative Economic Insect Report is issued weekly as a service to American Agriculture. Its contents are compiled from information supplied by cooperating State, Federal, and industrial entomologists and other agricultural workers. In releasing this material the Division serves as a clearing house and does not assume responsibility for accuracy of the material.

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Survey and Detection Operations
Plant Pest Control Division
Agricultural Research Service
United States Department of Agriculture
Washington 25, D. C.

INSECTS NOT KNOWN TO OCCUR IN THE UNITED STATES ^{1/}
(73-105 of Series)

This series was initiated early in 1957 as an aid to strengthening the detection program against foreign insect pests not known to be established in this country. The statements have been released individually in the Cooperative Economic Insect Report, but due to requests for complete sets of the series, the separates published during a year have been assembled under one cover at the close of that year. This is the third such compilation. The separates will continue to appear periodically in the Report. Preparation of this material has been made possible through the generous cooperation of Plant Quarantine and Entomology Research Division, ARS, and the U. S. National Museum. Lists of the foreign pest releases included in CEIR volumes 7 and 8 can be found on the last two pages of this publication.

Note: Number 94 of the series was deleted from the 1959 compilation since the species concerned, Phytomyza rufipes, had been recorded in Oregon by K. E. Frick, prior to the release of the writeup in the CEIR. Details can be found in CEIR 9(47):1007.

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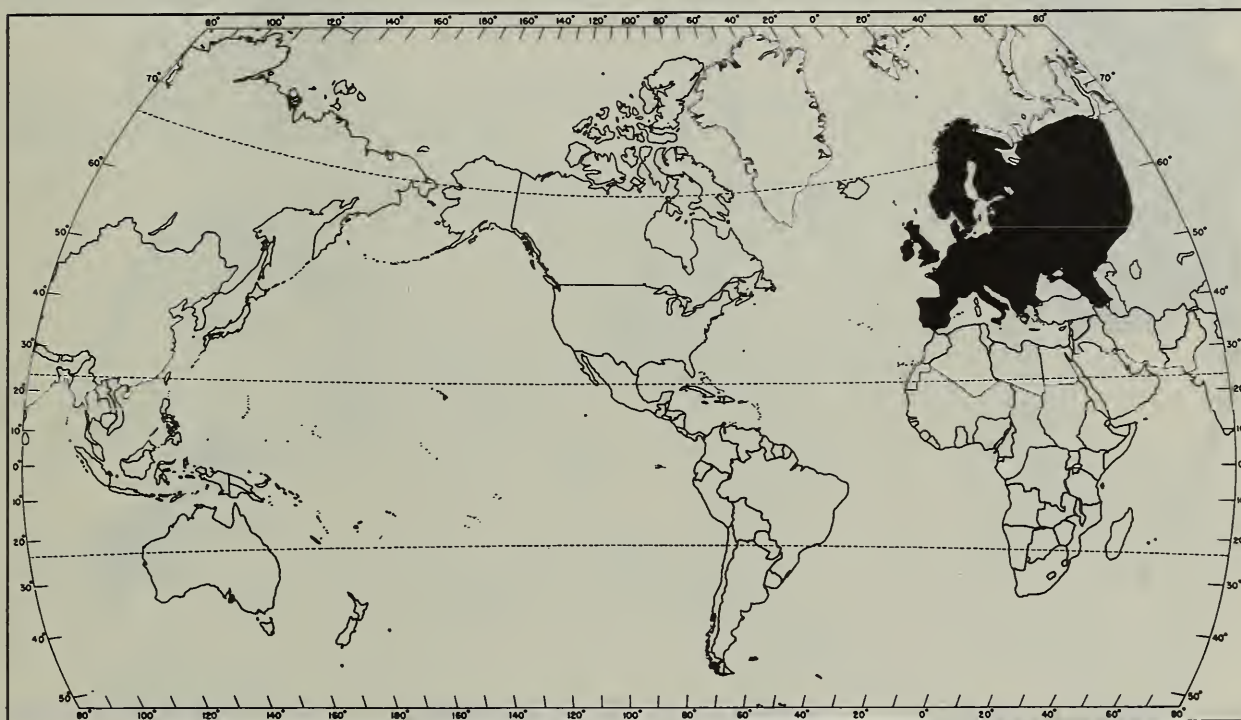
INSECTS NOT KNOWN TO OCCUR IN THE UNITED STATES

BROWN CHAFER (Serica brunnea L.)

Economic Importance: This scarab is a common pest in parts of Europe. The adults have been known to defoliate trees and shrubs in outbreak years, but the most important damage is caused by the root-feeding grubs. Studies have shown that larvae of this insect are one of the worst pests of nursery stock in Britain. Larval damage to golf links and other grass areas has also been reported. The grubs girdle the young stems and roots causing stunting or death of the plants.

Distribution: Europe, including British Isles; more common in northern areas.

Hosts: Adults feed on trees and shrubs. Larvae feed on roots of a wide variety of hosts, especially grasses.

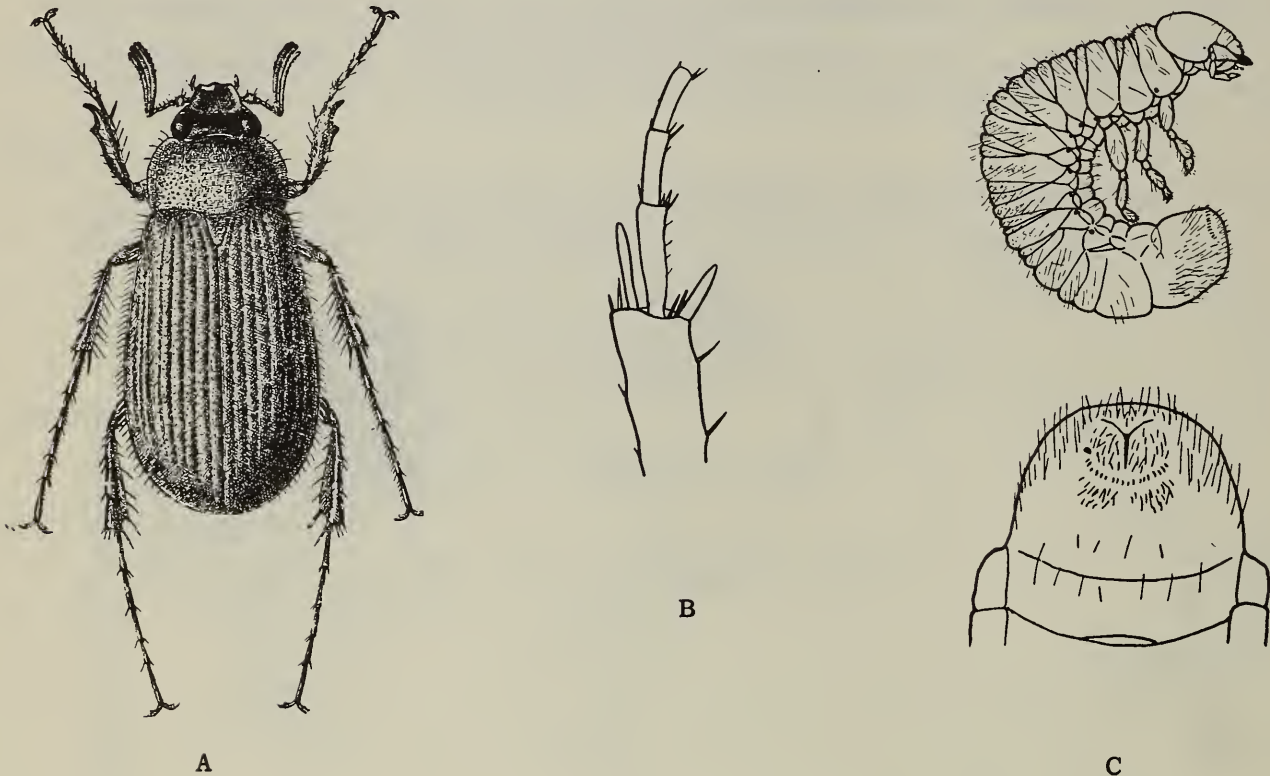


General Distribution of Serica brunnea

Life History and Habits: Adults emerge in early July and fly in swarms at sunset and the early evening. Eggs are deposited in sunny situations, 3 to 5 inches in the soil. The eggs are laid in a single series of 12-25 about 3 weeks after emergence. They are deposited in compact balls. Average length of the egg stage is 17 days, while the larval stage lasts about 22 months. Pupation takes place in the soil and lasts about 6 weeks.

(Scarabaeidae, Coleoptera)

Description: ADULT 8-10 mm. long. Head, thorax and wing covers dull, light reddish-brown, not noticeably hairy. Anterior tibiae toothed on external side. The extremities of the posterior tibiae show two widely-separated spurs. First segment of posterior tibia longitudinally striated on the inside. The claws are large and divided. The extremities of the elytra do not have a membranous border. LARVA white, markedly curved and wrinkled. Anal orifice longitudinal. Raster (see illustration) shows a single transverse row of spines. (Prepared in Survey and Detection Operations in cooperation with other ARS agencies and the U. S. National Museum). CEIR 9(48):11-27-59.



Figures of Serica brunnea: A - Adult, greatly enlarged. B - Tibia and tarsus. C - Larva and larval raster.

Principal references: Great Brit. For. Comm. 1927. Lflt. #17, Fidler, J. H., 1936. Annals of Appl. Biol., 23, Pt. 40.

Figures (except map): Tibia and tarsus from Britton, E. B. 1956. Handbooks for the identification of British Insects (Roy. Ent. Soc. London) 5(2), 29 pp. Adult from Medvedev, S. I. 1952. Zool. Inst. Akad. Nauk. n. s. 52. Fauna SSSR. Coleoptera 10(2), 274 pp. In Rus. Larva and larval raster from Fidler, J. H. 1936. Ann. Appl. Biol. 23(1):114-132.

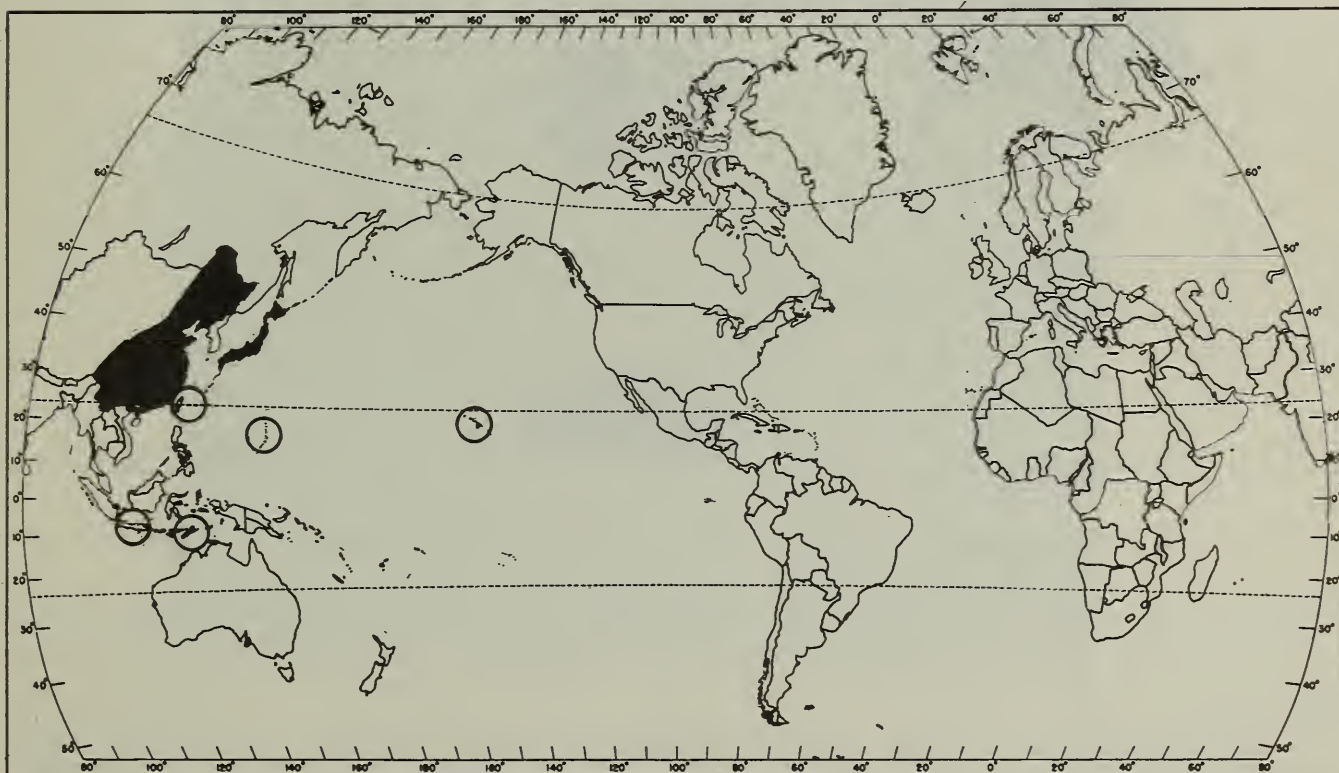
INSECTS NOT KNOWN TO OCCUR IN THE UNITED STATES

CHINESE ROSE BEETLE (Adoretus sinicus Burm.)

Economic Importance: This scarab is a serious defoliator of many economic plants. When adults are abundant, they completely skeletonize the foliage of host plants. The larvae feed underground, mostly on dead organic matter. This beetle is rated as a notorious pest in Hawaii where it has been known for over 60 years. Although the species has a number of parasites and predators in the Islands, it continues to thrive and cause damage. No very satisfactory control methods have been developed in this area. Severe damage from Chinese rose beetle has also occurred on Guam.

Distribution: Hawaii, Japan, Formosa, China, Timor, Java, and Marianna Islands.

Hosts: Attacks many plants including rose, grape, okra, beans, soybeans, sweetpotato, asparagus, cotton.



General Distribution of Chinese Rose Beetle

(Scarabaeidae, Coleoptera)

Life History and Habits: Adults fly at dusk and feed on foliage. They may be found in the daytime hiding in loose soil or debris. Attacked leaves show numerous small holes or complete skeletonization. Eggs are laid in the soil and hatch in about four days. Larvae feed underground on decaying plant material, rarely attack live roots. Pupation occurs in earthen cells. Life cycle requires about six or seven weeks.

Description: ADULT - Fuscous, with copper luster, densely punctuate, flatly pubescent. Luster hardly noticeable due to recumbent hairs. Antennae and legs, chestnut brown. Length about 9.3 mm. The pygidium or anal end is set with long bristles. The border of the pygidium and the abdominal ring are set with a row of stiff bristles. The fore tarsi have 3 sharp teeth. (Prepared in Survey and Detection Operations in cooperation with other ARS agencies. Special material for this summary supplied by O. C. Chock, Div. Ent. and Mkts., Board of Comm. of Agr. and For., Honolulu, Hawaii). CEIR 9(30):7-24-59.



Adults of Chinese Rose Beetle

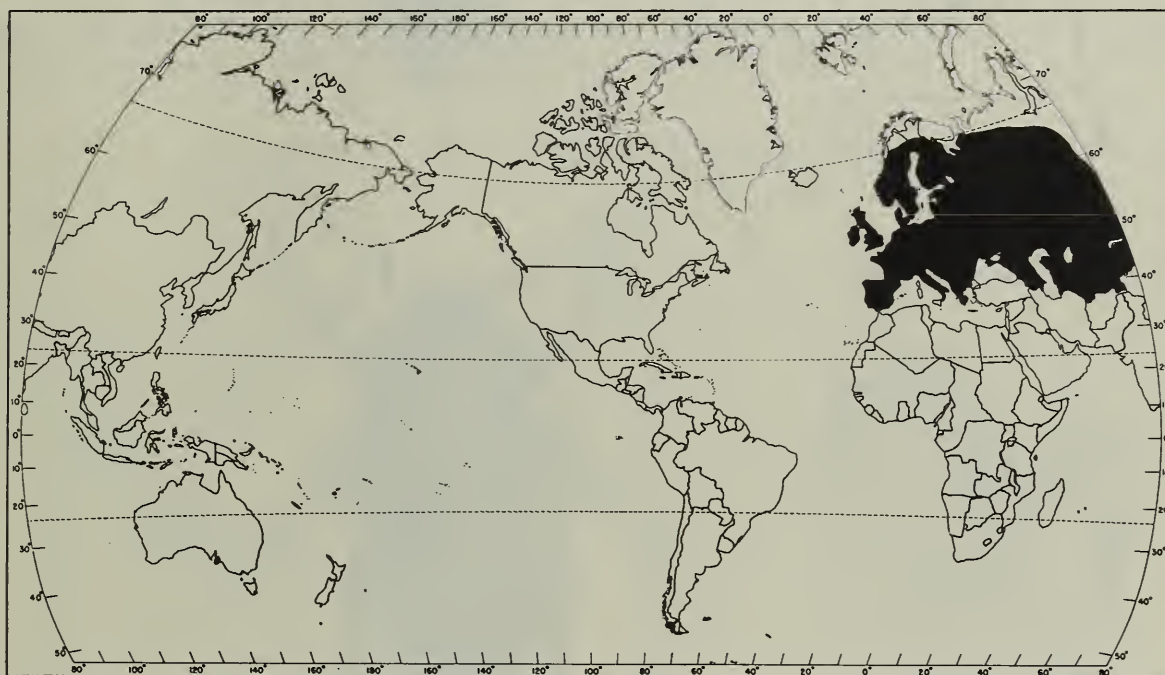
INSECTS NOT KNOWN TO OCCUR IN THE UNITED STATES

SUMMER CHAFER (Amphimallon solstitialis L.)

Economic Importance: This near relative of the European chafer (Amphimallon majalis) is an important pest of the roots of many plants. Although the adults feed on the leaves of various trees, the principal damage is caused by the larvae. Damage to crops and grasses is frequently reported in the European literature. Nursery stock is often injured also. The larvae girdle the young stem and roots causing retarded growth or loss of stand. Some of the more important crops attacked are grains, pastures, beets, potatoes and alfalfa.

Distribution: Europe, including the British Isles, and central Asia.

Hosts: General feeder: adults feed on foliage, larvae on roots.

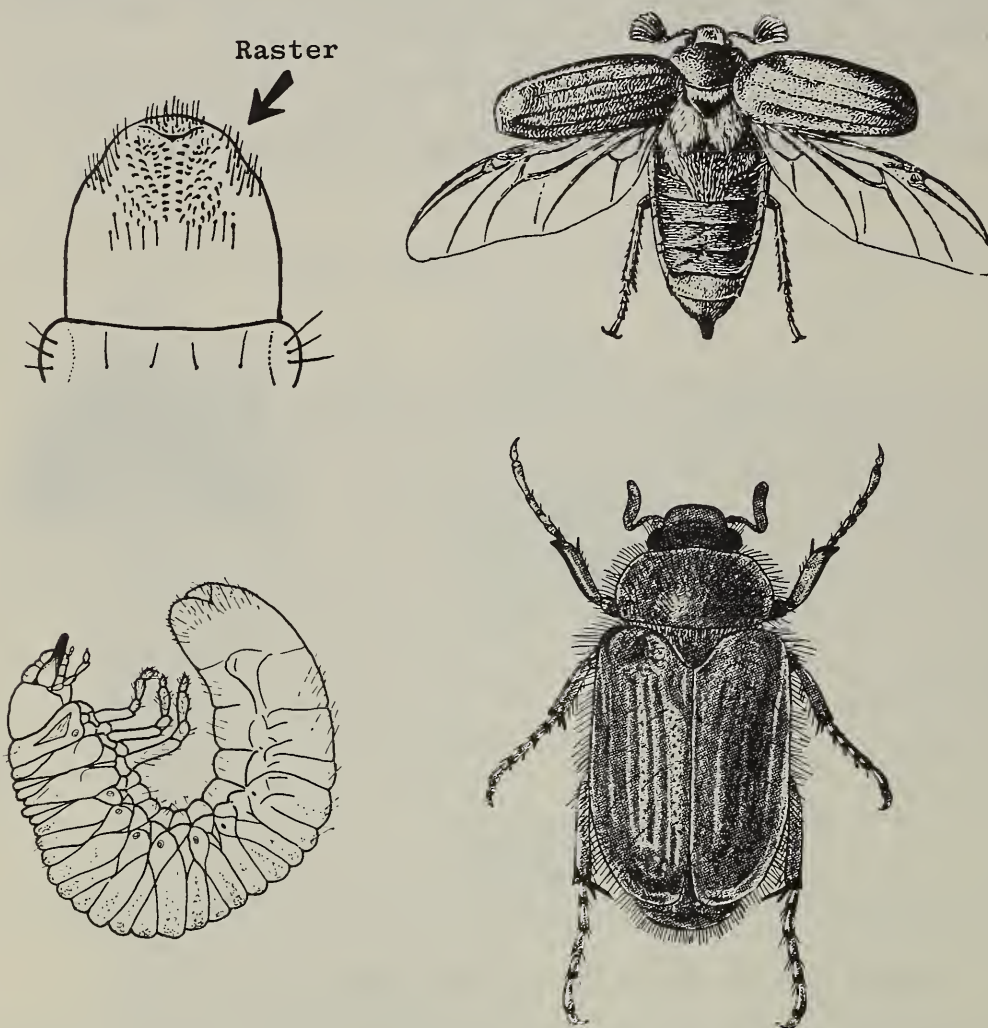


General Distribution of Amphimallon solstitialis

Life History and Habits: Adults emerge in July and fly, often in dense swarms, in the evening, principally from 8:30 to 10 p.m. During the day the beetles seek shelter in the soil or undergrowth. The females burrow 3-5 inches into the soil in sunny situations to oviposit about 3 weeks after emergence. One series of eggs, 25-35, is laid singly or in groups of two or three. The egg stage lasts from 18-28 days. Average length of larval stage is about 21 to 31 months. Pupation occurs at soil depths of 6-8 inches. Some of the larvae pupate before July, the normal emergence period, others hibernate and pupate the following spring. Temperature and humidity are mainly responsible for the varying length of the life cycle, which may take 2 or 3 years. These factors are also apparently responsible for restricting the distribution of the insect within Great Britain.

(Scarabaeidae, Coleoptera)

Description: ADULT about 16 mm. long. Color light brown to yellowish. Antenna 9-segmented. Posterior angle of pronotum well-marked. Elytra glabrous, simply ornamented. Some large bristles on the sides. Fresh specimens are distinctly hairy. GRUB is typical of scarabaeid larva in appearance. It is about 31 mm. long when full-grown. The rastrel pattern, shown in the accompanying illustration, identifies the larva of A. solstitialis. (Prepared in Survey and Detection Operations in cooperation with other ARS agencies). CEIR 9(45):11-6-59.



Mature Larva, Anal Segment of Larva and
Adults of Amphimallon solstitialis

Figures (except map): Anal segment of larva from Gt. Brit. Forestry Comm. Leaf. 17, 6 pp., 1927. Larva from Fidler, J. H. 1936. Ann. Appl. Biol. 23(1):114-132. Adult from Natvig, L. R. 1928. Norske Insekter. 315 pp., Oslo.

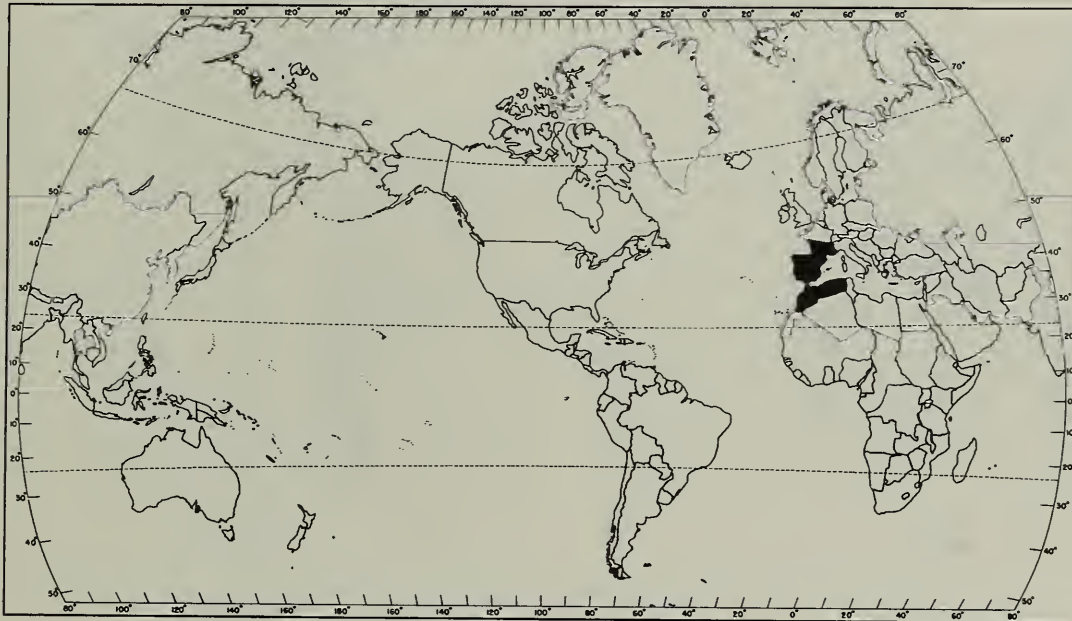
INSECTS NOT KNOWN TO OCCUR IN THE UNITED STATES

BLACK ALFALFA LEAF BEETLE (Colaspidema atrum (Olivier))

Economic Importance: This chrysomelid is one of the most injurious pests of alfalfa in Spain, sometimes destroying the first two cuttings of the crop. It is also serious on alfalfa in southern France.

Distribution: Spain, Portugal, southern France, Algeria, and Morocco. Some early reports indicate possible occurrence in Italy and the Kiev area of the Ukrainian SSR.

Hosts: Alfalfa. In absence of preferred host will apparently feed on many plants including beans, clover, vetch, parsley, potato and wheat.

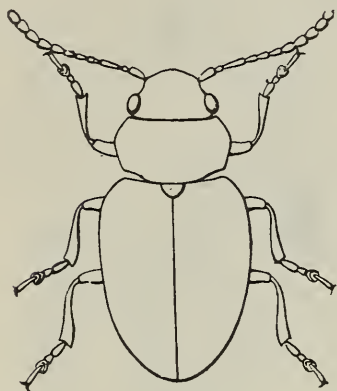


General Distribution of Colaspidema atrum

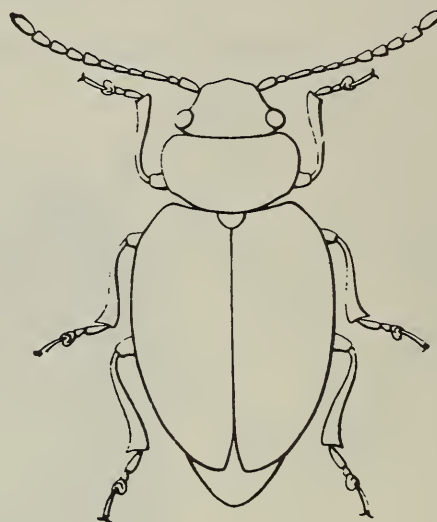
Life History and Habits: Adults emerge from soil in early spring. After copulation, oviposition begins in alfalfa fields. The female lays about 400 eggs, cementing them to leaves and stems. Eggs hatch in 10-15 days. The larvae and the adults feed together on the leaves skeletonizing them or leaving only the midrib. In Spain the larval infestations are most intense before the second cutting. Larval development requires about 14-20 days, after which the insect enters the soil to pupate. Pupation occurs in about 12 days but the adults remain in the soil until the following spring. There is only one principal generation a year; however, according to reports there may be a light second generation.

(Chrysomelidae, Coleoptera)

Description: ADULT small, 4 to 6 mm. long, brilliant black. Antennae partially reddish, 11-segmented. Head large and thick. Eyes small and projecting. Pronotum about two times broader than long; anterior angles obtuse, posterior angles strongly rounded. Elytra short, oval, uniformly punctate like the pronotum and head but without striations. Tarsi four-jointed, claws simple. EGG about 1 mm. long, yellow. LARVA yellow at first, attaining length of 10 to 12 mm. Larval form slightly recurved. Head very large, brownish, with 6 ocelli on each side. Body dirty yellow with numerous blackish plaques almost masking ground color, bristly hairs numerous. Last abdominal segment entirely black dorsally. (Prepared in Survey and Detection Operations in cooperation with other ARS agencies). CEIR 9(42):10-16-59.



Male



Female

Adults of Colaspidema atrum

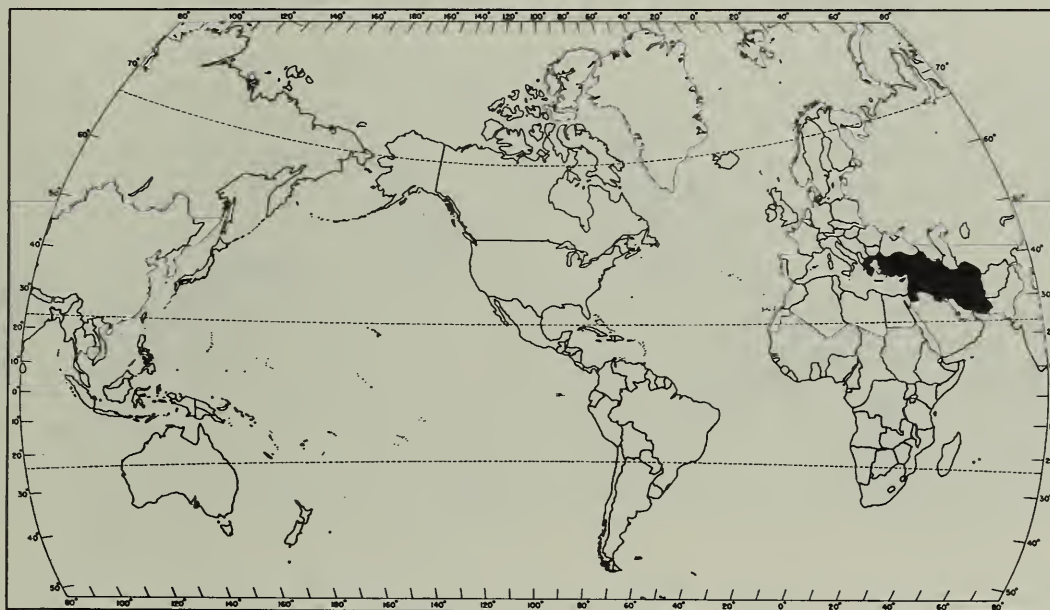
Figures (except map) from Gomez Clemente, F. 1929. Bol. de Patol. Vegetal y Ent. Agr. 4(15/18):152-156.

Major reference: Balachowsky, A. and Mesnil, L. 1936. Les Insectes Nuisibles aux Plantes Cultivees. pt. 2:1228-1231.

INSECTS NOT KNOWN TO OCCUR IN THE UNITED STATES

CEREAL LEAF MINER* (Syringopais temperatella (Led.))

Economic Importance: This scythridid has been known as a major pest of cereal crops in the Middle East for some time, although there seems to be very little in the economic literature on it until recent years. Complete destruction of small grains has been recorded in many areas of the Middle East, Asia Minor and on Cyprus during dry years. The annual loss to wheat in Jordan is estimated at 15 to 20 percent. In heavily infested fields, as many as 30 larvae may be found on a single leaf blade and over 100 on a single plant. Infested leaves turn light brown and are very conspicuous during dry seasons. Rainfall has considerable bearing on the intensity of infestations, though it is not so much the abundance of rain but rather its distribution which is important. If early rains fail, the infestations will be negligible, even if heavy rains occur later in the season. Heavy rains in November and December cause heavy infestations to develop. Cultural practices have considerable effect on populations. Deep spring plowing, crop rotation and clean crop cultivation are most beneficial though they may not all be practical to apply in the more arid regions.



General Distribution of Syringopais temperatella

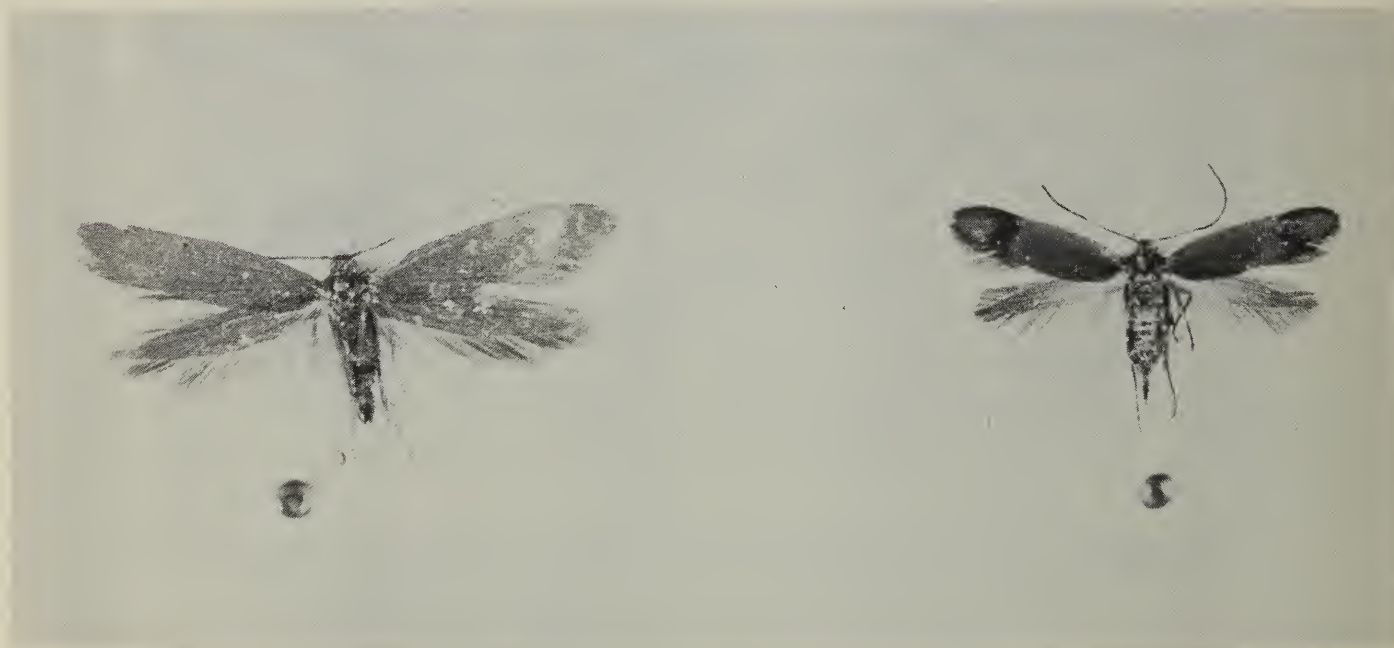
Distribution: Recorded in Cyprus, Turkey, Lebanon, United Arab Republic (Syria), Jordan, Iraq, Israel and Iran.

Hosts: Wheat, barley and oats are the preferred hosts, although 28 additional host plants including clovers, nasturtium, glorybind and plantain have been recorded.

Life History and Habits: Moths first appear in April, becoming abundant the latter part of the month. Egg laying begins soon after emergence and continues for about 10 days, the adults dying soon afterward. Each female will lay about 50 eggs, in small batches or singly on the leaf blade. Eggs hatch in 5 to 7 days,

young larvae descend almost immediately to the soil where they build webby cocoons and enter a long diapause which lasts until the following winter. Larvae may leave their cocoons if the relative humidity changes; however, if this change takes place after the larvae enter diapause they may be rapidly killed by turgidity or dessication. About the first of January, larvae begin to emerge from the soil to attack young leaves. The mining becomes conspicuous during February and March. They mine the leaves, feeding on cells and internal tissues, leaving the epidermis transparent. They usually enter the leaf from the tip and work downward towards the base. Larvae pass through 6 instars, becoming darker after each stage. When mature, the larvae enter the soil to pupate, constructing cocoons at a depth of 2-3 cm. Adults emerge in 2 weeks or less.

Description: EGG citron-yellow, oval, surface notched, about 0.5 mm. long. LARVA black at hatching but becomes brown, the last instar being grayish-yellow. Head brilliant black and plate of last abdominal segment also black. Sides covered with soft hairs. Mature larvae will vary from citron-yellow to clear brown to mahogany-brown. COCOON round, about 2 mm. to 3 mm. in diameter, covered with grayish-white web. ADULT with brown forewings, thorax and abdomen black and covered with yellowish soft hairs. Wing expanse 12-18 mm. (Prepared in Survey and Detection Operations in cooperation with other ARS agencies and the U. S. National Museum). CEIR 9(38):9-18-59



Female and Male of Syringopais temperatella

Adults - USDA photograph

Principal references:

1. Georghiou, G. P. and Thiakides, T. 1958. Soc. Ent. d'Egypte Bul. 42:229-231.
2. Hussein, S. Y. 1953. FAO Plant Protect. Bul. 2(2):22-23.
3. Rivnay, E. 1956. Ktavim (Records Agr. Res. Sta., Israel) 7(1):5-23.

INSECTS NOT KNOWN TO OCCUR IN THE UNITED STATES

CLOVER ROOT WEEVIL (Amnemus quadrituberculatus (Boh.))

Economic Importance: This Australian curculionid was not recognized as a pest of major economic importance until 1956, when efforts to provide a legume for the nitrogen-deficient grass pastures of the Richmond River District, New South Wales, were brought to a virtual standstill by its depredations. During 1956, practically all the subterranean clover stands in that district were destroyed. The larvae cause most of the damage. Typically, the larvae gouge out or sever the clover root about one-half inch below ground level. The adults feed only on the above-ground portions of legumes and do little damage. The effects of clover root weevil injury are much more apparent on clovers with well defined tap roots, such as subterranean, crimson and red clover. White clover is better able to withstand feeding by the insect.



Adult Damage to Leaves
and Petioles



Larval Damage to Tap Root
of Clover

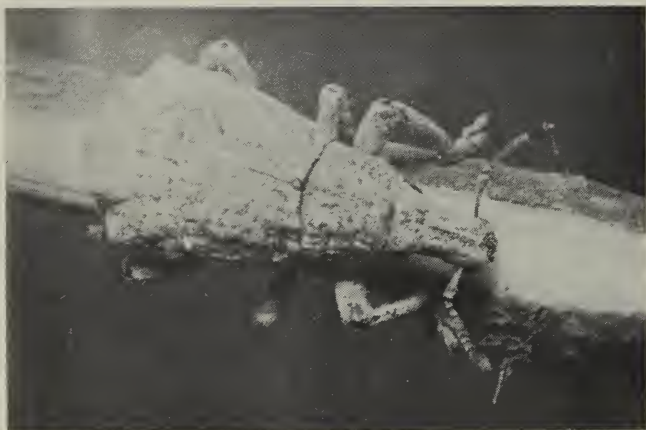
Hosts: Subterranean, red, crimson and white clovers are the major crops attacked. Adults will also feed on a wide variety of legumes including Desmodium sp., Dolichos lablab, Glycine javanica, Phaseolus bracteatus, Crotalaria sp., Trifolium hybridum (alsike clover), and Desmodium sandwichense which is particularly favored as a summer host. Larval damage has been recorded on vetches in the field.

Distribution: Occurs along the coastal districts of New South Wales and Queensland, Australia. The Manning River in New South Wales is regarded as the southern limit of the species from an economic standpoint.

Life History and Habits: The adults are present in the field from spring until early winter. They begin feeding as soon as they emerge and continue to feed actively throughout the warm summer and autumn months. They stand astride the edges of the leaves making typically round cuts as they feed. In winter, very little feeding takes place. After emergence, some weeks elapse before sexual maturity is reached and egg laying begins. Females lay up to 1,100 eggs each in

the laboratory, but on a much smaller scale in the field, probably about one-fourth as many. Eggs are laid in central hollows of clover petioles, being generally deposited in the lower portion where the hollow is well defined. Groups of 3 or 4 eggs along the length of the hollow are common, but chains of up to 14 have been found. Oviposition has only been recorded on red, white, alsike and subterranean clovers. Eggs hatch 10 to 51 days under laboratory conditions, being longest in midwinter. Larvae are found in the soil from fall until spring, during which development takes place. The larvae pass through seven instars over a period of 12 to 16 weeks after which they enter a prepupal stage for 2 to 9 weeks. The prepupal and pupal stages are passed in an earthen cell. The depth at which larval feeding occurs depends on soil moisture. Larvae feed throughout their development, but damage to plants is most pronounced in autumn and early winter. The pupal stage lasts 18 to 26 days under laboratory conditions.

Description: ADULTS - Length 7 to 12 mm., the females usually longer and broader than the males. Body color is variable, ranging from deep gray to black to brick-red. Fawn, ranging to brick-red is the most common color. The rostrum is typically curved. There are four pronounced spines on the fused elytra. LARVAE - White, legless, ranging from 1.6 mm. in length in first instar to 9 mm. in final instar. The head is large, honey-colored and has two prominent white stripes on the frons. EGGS - Cigar-shaped and approximately 1.5 mm. long and 0.5 mm. wide. When laid, eggs are white, but after a few days change to pale yellow. (Prepared in Survey and Detection Operations in cooperation with other ARS agencies). CEIR 9 (36) : 9-4-59.



Adults and Larva of Amnemus quadrituberculatus

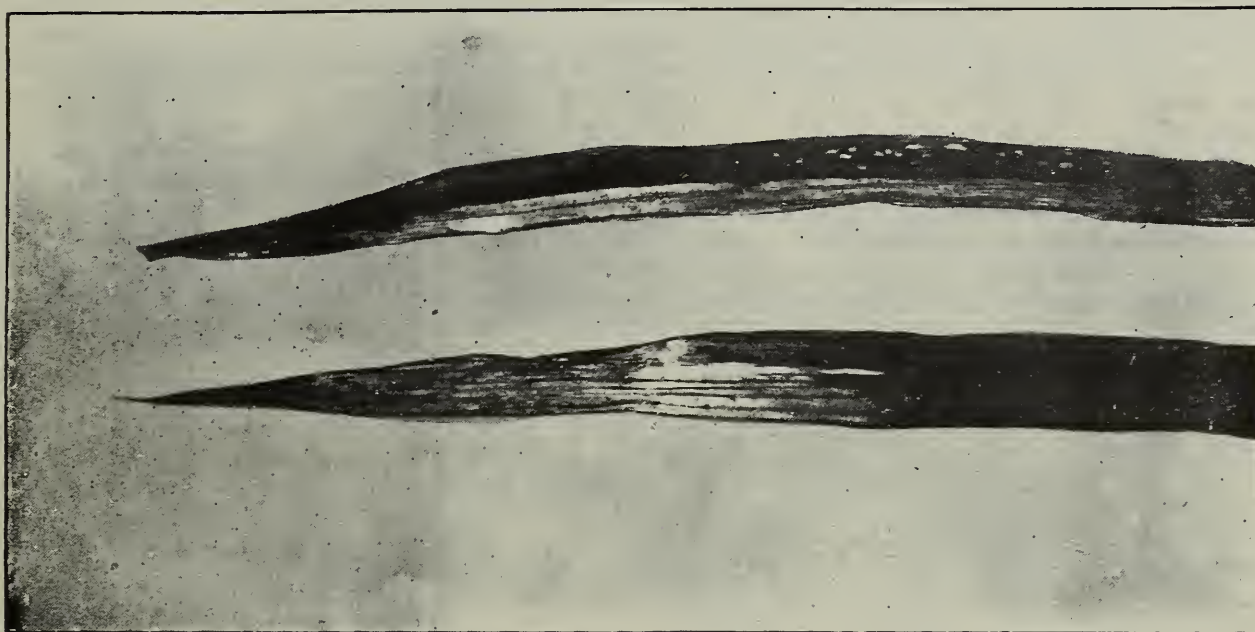
Illustrations furnished through the courtesy of Division of Science Services, Department of Agriculture, New South Wales.

Reference: Braithwaite, B. M., Jane, A. and Swain, F. G. 1958. Austral. Inst. Agr. Sci. Jour. 24(2): 146-154.

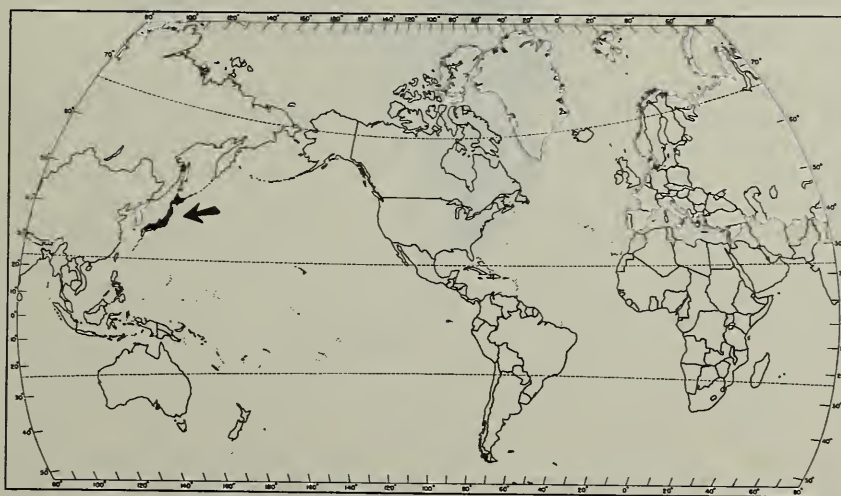
INSECTS NOT KNOWN TO OCCUR IN THE UNITED STATES

JAPANESE RICE LEAF MINER (Agromyza oryzae (Munakata))

Economic Importance: This leaf miner has been called the most serious pest of rice in Japan. Its damage is especially severe in the more northern areas where the growing season is shortened. Infested plants have dried leaf tips and reduced number of side shoots. Growth and maturity are retarded. Heavily infested fields have a scorched appearance. About four percent of the crop is lost annually to this in Akita Prefecture.



Damage to Rice Leaves



General Distribution of Agromyza oryzae

(Agromyzidae, Diptera)

Hosts: Cultivated and wild rice, reed and foxtail grasses.

Distribution: Japan (north temperate).

Life History and Habits: In the Hokkaido region there are one to three generations annually. The insect passes the winter in the pupal stage in the soil on rice stubble in the fields. Adult emergence begins about June 1. The flies are very active on warm, calm days. The female inserts her eggs singly in the epidermis of the rice leaf. An infested leaf has a speckled appearance. The larvae hatch in 6 days and mine downward in the leaf. This leads to formation of a white to brown irregular blotch. The larval period covers about 10 days, after which pupation occurs, usually on the upper or lower surface of the leaf or on the sheath. Most of the flies of the earlier generations emerge after 7 to 18 days but some of the puparia remain in diapause. Most of the puparia of the later generations go into hibernation.

Description: Adult about 2.5 mm. long, wing expanse 6 mm.; black or brownish with light brown or reddish eyes. Egg elongate, elliptical, white, about 1 mm. long. Larva white, flattish, 5 mm. long. There are two types of puparia. They may be distinguished as follows: the hibernating are light yellowish-white, changing to dark-gray to nearly black and are easily dislodged from leaves; the non-hibernating are light yellowish-white to pale-green to greenish-brown and adhere closely to the leaves. (Prepared in Survey and Detection Operations in cooperation with other ARS agencies.) CEIR 9(10) 3-6-59.



Adult male of Agromyza oryzae

Figures (except map): Adult from Iconographia Insectorum Japonicorum. Ed. 2., 1954. 1736 pp., Tokyo. Damage from Kuwayama, S. 1928. Hokkaido Agr. Exp. Sta. Bul. No. 47. (Both publications in Japanese).

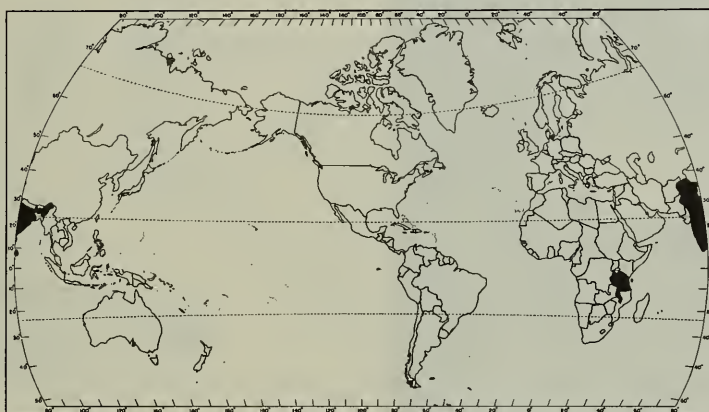
INSECTS NOT KNOWN TO OCCUR IN THE UNITED STATES

MAIZE AND JOWAR BORER (Chilo zonellus (Swinhoe))

Economic Importance: This crambid borer is a very serious pest of corn and sorghum in areas of India and Pakistan; perhaps the major pest of those crops in that area. Damage can be quite severe, with infestations in corn and sorghum ranging from 2.6 to 24.3 percent annually in India and reaching as high as 20 percent in the Loghman Valley of Afghanistan. During 1957 and 1958, infestations caused moderate to severe injury in West Pakistan. This species has been recorded under several former names, the one of greatest importance being Chilo simplex; however, since 1928 this species has been considered distinct. Chilo suppressalis (also previously known as C. oryzae) was also recorded as C. simplex prior to 1928. Consequently, older literature records may be in reference to both C. suppressalis and C. zonellus.

Distribution: Known to occur in India, Pakistan, Afghanistan, Ceylon and Sikkim in Asia and Tanganyika and Nyasaland in Africa.

Hosts: Corn and sorghum are preferred hosts. Sugarcane is attacked only when it is grown adjacent to corn and sorghum. Additional recorded hosts are ragmillet, goosegrass, pearl millet and Jobstears.



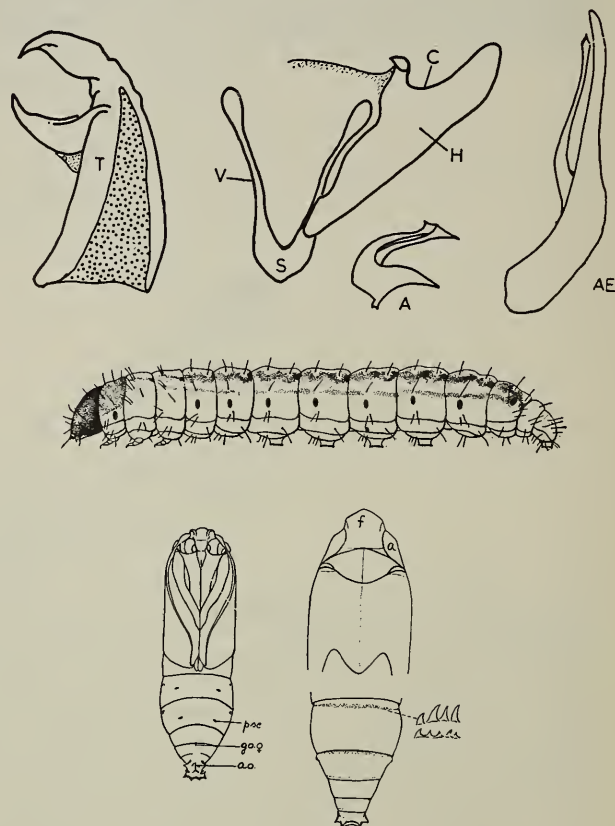
General Distribution of Chilo zonellus

Life History and Habits: The biology of C. zonellus as observed in India is as follows: The adults are nocturnal and short-lived. Maximum emergence of adults begins when the temperatures reach 86-90° F. Eggs are laid in clusters of 10-36, within 2-5 cm. of the leaf base, and hatch in 2-4 days. Each female will lay about 100 eggs. The larvae pass through 5 instars in 15-31 days. Young larvae begin feeding on the leaf tissues, sometimes mining them, and later, when they become more mature, bore into the stalks or cobs of corn. Larval borings in the stalks may cause the plants to bend, twist over and produce branches. "Deadhearts" are commonly encountered in young plants. Ears are also damaged. The larvae may migrate from plant to plant. Pupation takes place in the stems of the plants and lasts from 2-9 days. A total of 6-7 overlapping generations are reported. The total duration of the life-cycle is 29-33 days in the summer and as much as 83-210 days in the winter. The insect hibernates as a mature larva in the stems, stubble and cobs of corn, and the stems and stubble of sorghum. In corn, the stubble seems to be preferred for hibernation, while in sorghum, the stems are preferred. Plantings of corn made between July 15 and July 30 are about twice as heavily infested as those made 4-6 weeks later. Larvae prefer the younger plants. Outbreaks in Nyasaland have been associated with low rainfall years.

Description: ADULT - Male: Forewing whitish-brown to straw-colored, with dark brown to piceous scales usually forming a streak on costa; three rather diffuse spots on disk and a shadowy band running from apex towards center of hind margin

(Crambidae, Lepidoptera)

but stopping halfway. Series of spots on termen small, usually entirely piceous or black; fringe slightly darker near base. Hindwings very light straw-colored. Frons conical, with a distinct corneous point; ventral surface not flattened, but smooth and without a ridge. Labial palpi two and one-half times length of head, covered with dark brown to whitish scales. Wing expanse 21-26 mm. **Female:** Usually much larger than male; forewing much lighter in color, with darker scales sparser and more diffuse; bands usually indistinct. Hindwing whitish. Wing expanse 28-30 mm. *C. suppressalis* is distinguished from *C. zonellus* in that the ventral surface of the frons is partly flattened and produced as a ridge. **LARVA:** Length about 25 mm., skin well chitinized, setae well developed. Head prominent, reddish-brown, mandibles with 6 teeth, lower 3 being pointed. Prothoracic shield well chitinized and prominent, yellowish-brown. Four longitudinal stripes on abdomen, 2 sub-dorsal and 2 lateral. Striped reddish-brown. Coloration may vary, however. Posterior trapezoidal tubercles slightly more lateral in position than anterior trapezoidal tubercles. Spiracles closed (no clear space inside), elongate oval and lie along lower margin of lateral stripes. Crochets on abdominal prolegs are arranged in complete circles. **PUPA** appears bent; color usually reddish-brown; eyes darker. Length of female 12.5-17 mm.; male 10.5-13 mm. Greatest width of female 3-4 mm.; male 2.5-3 mm. (Prepared in Survey and Detection Operations in cooperation with other ARS agencies.). CEIR 9(51):12-18-59.



Figures: Left, male and female of *C. zonellus*; upper right, male genitalia of *C. zonellus*; right center, larva of *Chilo* sp.; lower right, ventral and dorsal views of *C. zonellus* pupae.

Major references and figures (except map): Larva of *Chilo* sp. from Fletcher, T.B. (Editor). 1919. Report of Proceedings of Third Entomological Meeting, Pusa, India, Feb. 3-15, 417 pp. Pupal characters of *C. zonellus* from Isaac, P.V. and Venkatraman, T.V. 1941. Indian Jour. Agr. Sci. 11(5):804-815. Male genitalia from Jepson, W.F. 1954. A Critical Review of the World Literature on the Lepidopterous Stalk Borers of Tropical Graminaceous Crops. 127 pp., London. Description of male and female of *C. zonellus* from Kapur, A.P. 1949. Roy. Ent. Soc. London Trans. 101(11):399.

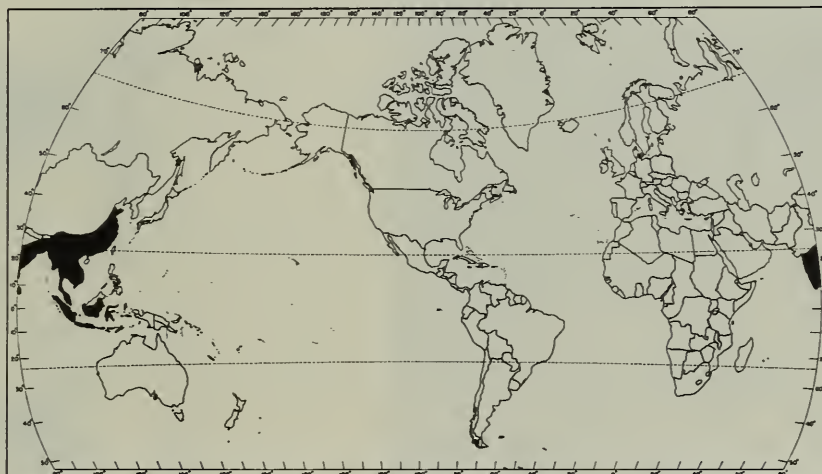
INSECTS NOT KNOWN TO OCCUR IN THE UNITED STATES

RICE STEM GALL MIDGE (Pachydiplosis oryzae (Wood-Mason))

Economic Importance: This gall-forming insect causes considerable losses to rice in various areas of Asia. Total damage may amount to 75 percent or more in India and losses of 50-100 percent have been reported in Indochina. When both the mother culm and primary tillers of the rice plant are attacked, loss in grain is greater than 60 percent; however, losses may differ considerably in various varieties of rice even if the incidence of infestation is the same. Characteristic damage to rice is evidenced by the forming of a long tube or gall with a green tip, known as "silver shoot" or "onion shoot," in place of the main stem. As a result of this gall, apical growth of the plant ceases.

Distribution: Occurs throughout most of India, East Pakistan, Burma, Ceylon, Thailand, Indochina, Indonesia and southern China. In addition, specimens which appear to be this species have been determined by H. F. Barnes from the French Sudan and the Sudan.

Hosts: Rice (Oryza sativa) is the principal host, both upland and irrigated varieties. Some other grasses, generally species of Panicum or Paspalum, have been recorded or doubtfully suggested as host plants, but as far as known there has been little, if any, biological experimentation with these hosts.

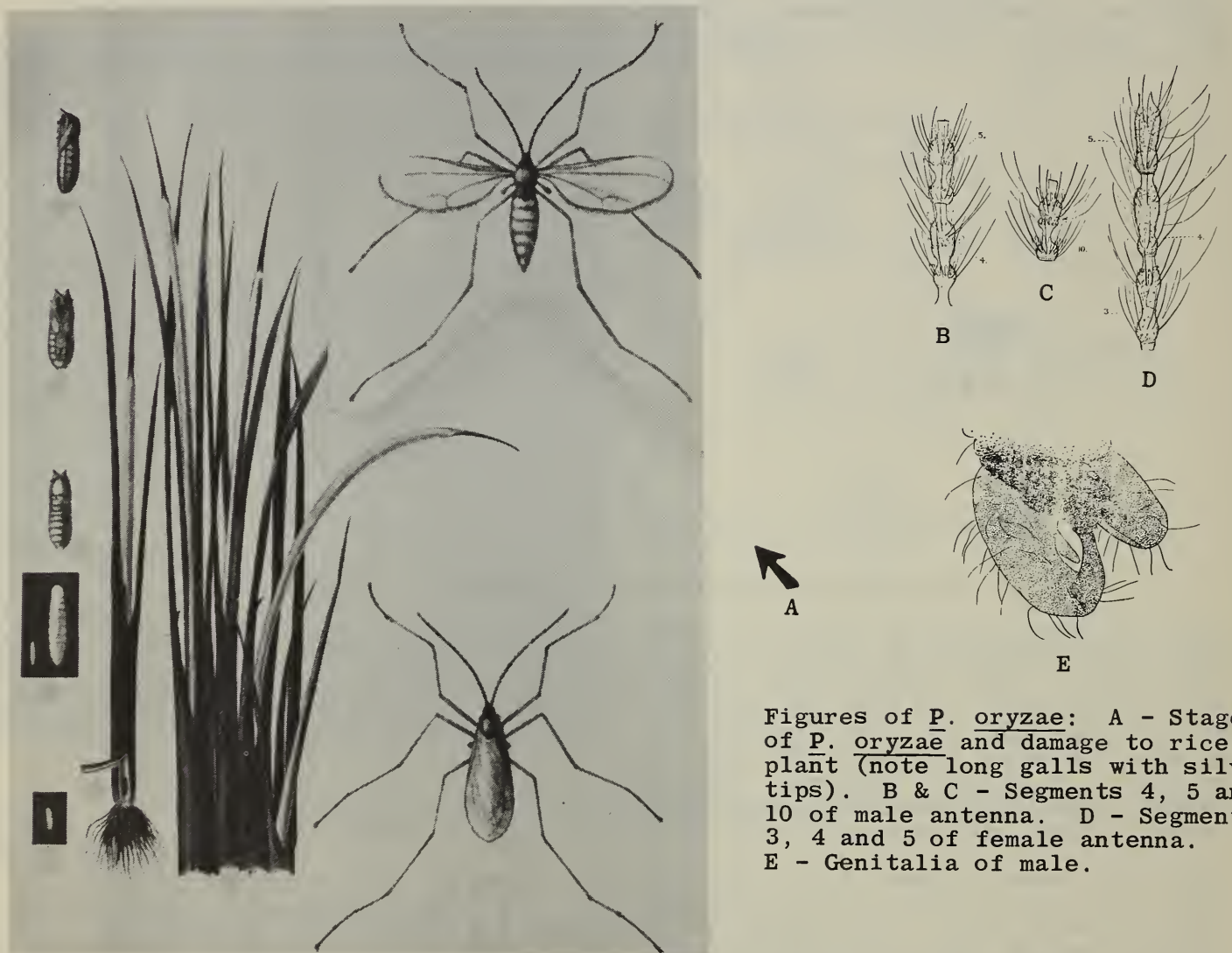


General Distribution of Pachydiplosis oryzae

Life History and Habits: Details of the biology as recorded in southern China by Yen, Liu and Kuo are as follows: There are 5 generations a year. Overwintering takes place in the larval stage within the rice stubble. Midges are first seen during late March and are most numerous in early August. The egg, larval and pupal stages last for 3-4, 14-28 and 4-5 days, respectively, between July and October. Females lay about 131 eggs each, with a maximum of 285. Midges are nocturnal, living for 1-3 days. Eggs are laid singly, or in groups, on the leaves. Newly-hatched larvae will survive immersion in water for 2-5 days. Larvae usually pupate by the time the tubular gall is noted.

Additional observations of the life history from other sources are as follows: The young larvae migrate down the plant until they reach the central shoot of the apical or side buds. As a result of feeding on the growing tip, the gall is formed from the leaf-sheaths which grow like an empty tube, carrying with it the blade, auricles and ligule. After emergence of the midge, the empty gall loses turgidity, becomes discolored and falls off. A single larva lives in each gall. Pupation occurs in the gall. The pupa works its way up the tube and emergence takes place. The empty pupal case is left protruding from the exit hole.

Description: The ADULTS, as described by M. S. Mani, are as follows: Male - Body yellowish-brown, sparsely haired. Length 3 mm. Antennae dark reddish-brown, thickly haired, nearly equal in length to body, segments 14 (see illustrations); palpi quadriarticulate, short, sparsely setose. Mesonotum brown, submedian lines sparsely haired. Scutellum dirty yellowish-brown, post-scutellum darker. Halter stem light yellowish; head grayish-brown. Legs densely hairy and dark brown. Claws simple on all legs, evenly and slightly curved. Abdomen brownish-yellow, sparsely setose. Genitalia pale-brown, somewhat thickly setose (see illustration). Female - Body bright reddish-brown, thickly haired. Length 3.5 mm. Antennae dark brown, moderately thickly haired, about half length of body, segments 14 (see illustration); palpi quadriarticulate, sparsely setose. Mesonotum dull reddish-brown at sides and brownish-black between submedian lines, which are thickly haired. Scutellum reddish-brown, post-scutellum dark reddish-brown. Legs brownish and sparsely setose. Claws simple on all legs, diverging and somewhat curved at very tip only. Abdomen bright reddish-brown in older specimens, moderately setose. Ovipositor short, conical, terminal lobes of lamellae with length $2\frac{1}{2}$ times its greatest width, sparsely setose. (Prepared in Survey and Detection Operations in cooperation with other ARS agencies). CEIR 9(49):12-4-59.



Figures of *P. oryzae*: A - Stages of *P. oryzae* and damage to rice plant (note long galls with silver tips). B & C - Segments 4, 5 and 10 of male antenna. D - Segments 3, 4 and 5 of female antenna. E - Genitalia of male.

Figures (except map): All stages and damage from Fletcher, T. B. (Editor). 1917. Report of the Proceedings, Second Entomological Meeting, Pusa, India, Feb. 5-12, 340 pp. Antennal segments and male genitalia from Mani, M. S. 1934. Records Indian Mus. 36(4):371-452. Major reference: Barnes, H. F. 1956. Gall Midges of Economic Importance. Vol. VII. Gall Midges of Cereal Crops. pp. 204-210, London.

INSECTS NOT KNOWN TO OCCUR IN THE UNITED STATES

APPLE BLOSSOM WEEVIL (Anthonomus pomorum L.)

Economic Importance: This weevil has a long history of damage to pomaceous fruit, particularly apple and pear, in Europe and Asia. Many British growers considered it one of the most important apple pests until the advent of DDT. Serious losses have been reported from several countries including France, Germany, England, Japan, China and U.S.S.R. Crop reduction of as much as 30 to 100 percent has been recorded in Germany and U.S.S.R. Investigations in Germany show that the yield of apples steadily decreases as infestation increases; some varieties yield no fruit when over 50 percent of blossoms are infested. Feeding of apple blossom weevil is especially serious in years when blossoms are light or scarce. Although A. pomorum is shown in some European literature as having been recorded in the United States, North American literature and the U. S. National Museum collection fail to verify such reports.



General Distribution of Anthonomus pomorum

Distribution: All of Europe, across U.S.S.R. to China, Japan and Korea.

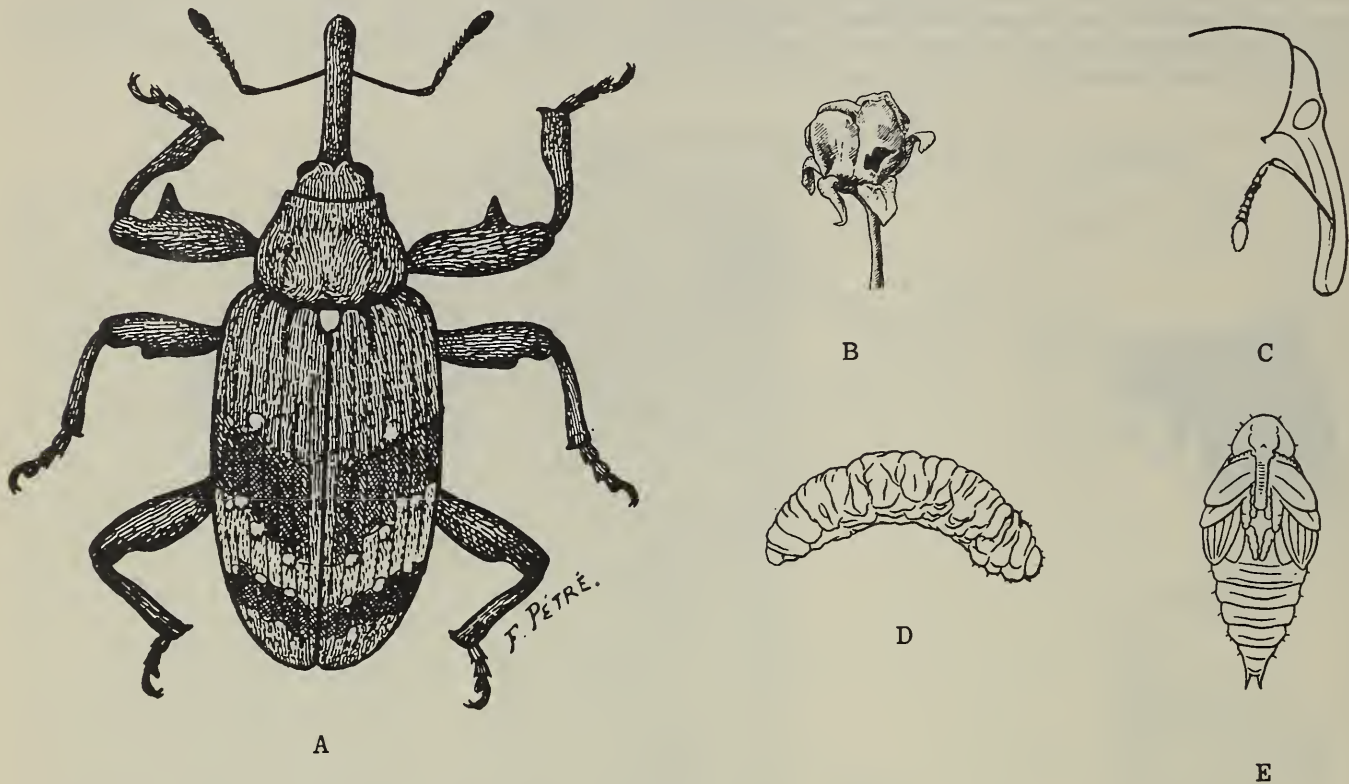
Hosts: Apple and pear are preferred. Other hosts include quince and hawthorn.

Life History and Habits: In England adults emerge from hibernation just before the green-bud stage of apple but are not very active until maximum daily temperature exceeds 50° F. The female bores into and deposits an egg in the developing flower. Each female will lay about 30 eggs. The larvae begin devouring the anthers and other internal floral parts soon after hatching. Feeding continues inside the flowers, causing the petals to wilt and die. These infested blossoms have a characteristic reddish-brown appearance and are referred to as "capped" blossoms. The larvae pass through 3 stages in about 14 to 16 days and pupate

(Curculionidae, Coleoptera)

inside the capped blossom. The new adult cuts a hole in the brown cap and escapes. These adults feed on foliage until the end of June or July, than hibernate until the following spring in debris or any available shelter.

Description: ADULT 4 to 5 mm. long. Body entirely covered with fine yellowish and ashen pubescence, giving it a general color more gray and less red than related species. Base of antennae, tibiae and tarsi are of a more clear red. Rostrum is longer than the head and prothorax together. The eyes project noticeably when viewed from above. Prothorax has a light ashen median line. Anterior femora have a strong, projecting tooth, anterior tibiae sinuous, enlarged toward middle. On the elytra, there is a chevron of ashen hairs which runs into bands of dark brown. LARVA whitish. PUPA pale yellow. (Prepared in Survey and Detection Operations in cooperation with other ARS agencies). CEIR 9(41):10-9-59.



Illustrations of apple blossom weevil (Anthonomus pomorum): A - Adult, greatly enlarged. B - Attacked blossom bud. C - Lateral view of head. D - Larva. E - Pupa.

Figures (except map): Adult and profile of head from Balachowsky, A. and Mesnil, L. 1935. Les Insectes Nuisibles aux Plantes Cultivees. Vol. 1, 1137 pp., Paris. Larva, pupa and damage from Minist. Agr. and Fisheries Advisory Leaf. 28, (Great Britain), 3 pp. 1946.

Principal References: (1) Balachowsky, A. and Mesnil, L. 1935. Les Insectes Nuisibles aux Plantes Cultivees. Vol. 1, 1137 pp., Paris. (2) Massee, A. M. 1937. The Pests of Fruits and Hops. 294 pp., London.

INSECTS NOT KNOWN TO OCCUR IN THE UNITED STATES

CITRUS PSYLLA (Diaphorina citri Kuwayama)

Economic Importance: This citrus pest is widespread in tropical and subtropical Asia. It has been called one of the most important citrus insects in India, particularly in the Punjab, where infestations have been especially damaging. Valuable orchards have been reduced to unproductive levels within two or three years in that country. Damage from the psyllid results from the withdrawal of large quantities of sap from the foliage, heavy development of sooty mold on honeydew-covered leaves, and possibly from a toxic substance injected into the plant tissue. The insect feeds on new growth and heavy, continued feeding leads to loss of fruit production, defoliation and death of the tree.

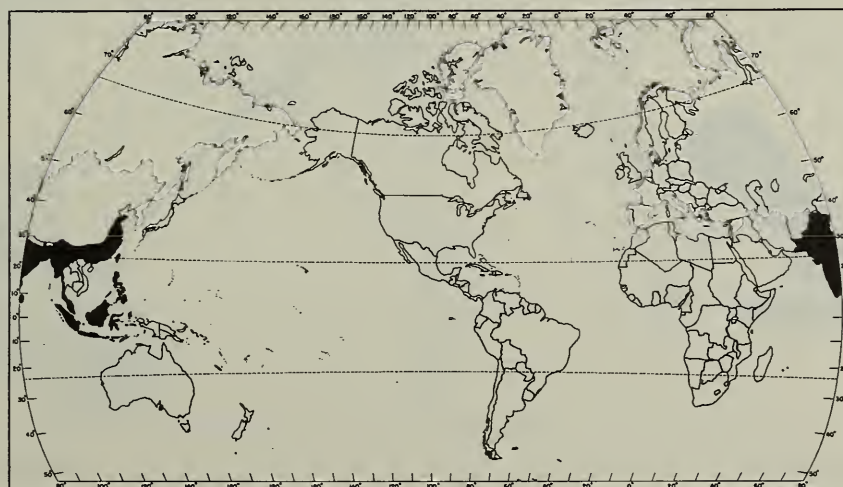


Damage to Citrus Tree

Distribution: Tropical and subtropical Asia, including China, India, Burma, Formosa, Philippine Islands, Malaya, Indonesia, Ceylon and Pakistan.

Hosts: Citrus spp. and other Rutaceae.

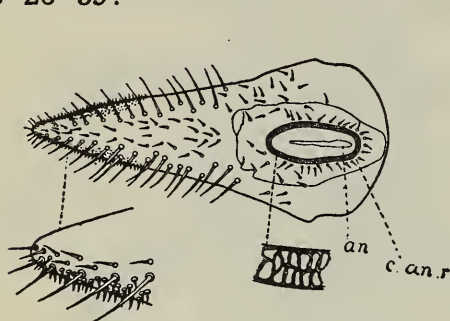
Life History and Habits: Eggs are laid only on tender shoots or other new growth, usually in crevices. The egg stalk is embedded in the plant tissue. In heavy infestations, the eggs are so numerous that terminal foliage has an orange appearance. The female may lay as many as 800 eggs over a period of 2 months. The eggs hatch in 4 to 6 days in the summer. There are five nymphal instars. Total life cycle requires from 15 to 47 days depending on the season, and the adult may live several months. There is no diapause but populations are low in the winter. As many as nine



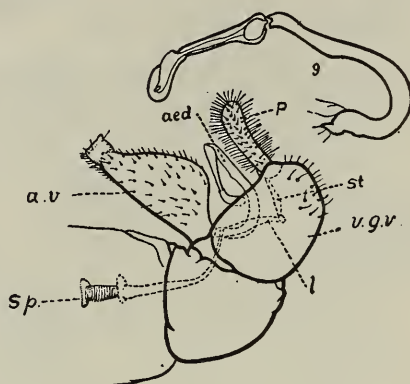
General Distribution of Diaphorina citri

generations a year have been recorded in India. In heavy outbreaks, the foliage is shiny and sticky from honeydew, and soon becomes black from sooty molds. The ground beneath the trees may appear white from honeydew deposits. Nymphs, which are always found on new growth, move in a slow, steady manner when disturbed. The adults leap when disturbed and may fly a short distance. They are usually found in large numbers on the lower sides of the leaves, with heads almost touching the surface and the body raised almost to a 30 degree angle. The period of greatest activity of the psyllid corresponds with the periods of new growth of citrus.

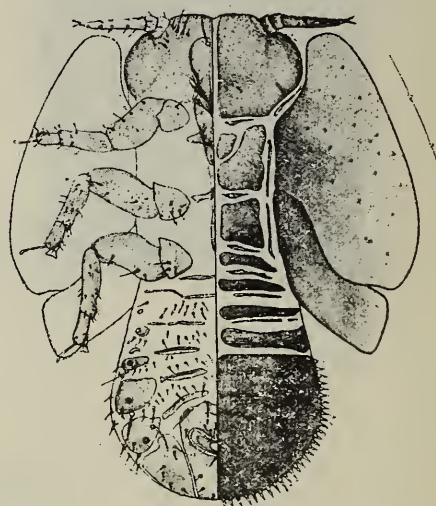
Description: EGG almond-shaped with slender stalk; 0.3 mm. long without stalk. Color, pale yellow at first, becoming orange. Nymph (fifth instar) generally light yellow with orange tinge in region of abdomen. In full-grown nymph antennae, tips of tarsi, and tip of rostrum dark; eyes dark red. Length of body, excluding spines, 1.6 to 1.7 mm. Margin of apical plate has series of lanceolate setae which are covered with waxy secretion. ADULT - Body 2.4 mm. long, forewing 2.4 mm. by 1.0 mm. (greatest width). General color brown, but not uniformly so. Antennae black at tip, tibia light; head, prothorax and abdomen sometimes light-whitish or yellowish. Abdomen usually grayish-brown, but orange in gravid female. Forewing with brown spots. The living insect is covered with a whitish waxy secretion and appears dusty. Male genital segment conspicuous, claspers long and slender. Female genital segment short, small, acute at tip. (Prepared in Survey and Detection Operations in cooperation with other ARS agencies). CEIR 9 (26); 6-26-59.



Female Genitalia



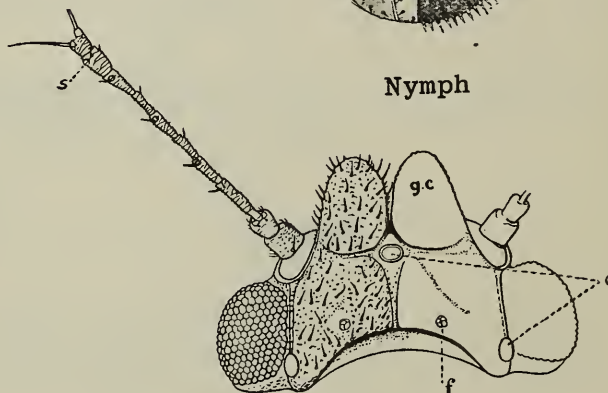
Male Genitalia



Nymph



Adult



Head of Adult

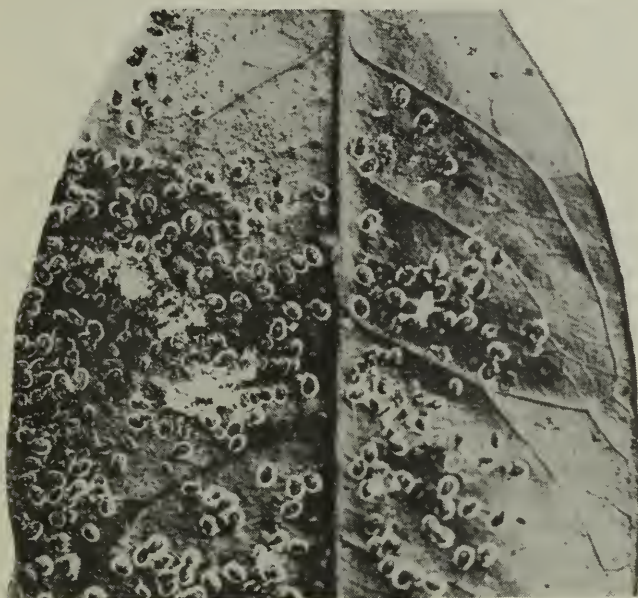
Figures of Diaphorina citri

Figures (except map) from Husain, M. A. and Nath, D. 1927. Dept. Agr. in India Mem. (Ent. Ser.) 10(2), 27 pp.

INSECTS NOT KNOWN TO OCCUR IN THE UNITED STATES

ORANGE SPINY WHITEFLY (Aleurocanthus spiniferus (Quaintance))

Economic Importance: This species has been called the most destructive aleyrodid attacking citrus in tropical Asia. It has been rated as the seventh most important citrus insect in Japan. An outbreak in the Kyushu area of that country was devastating until it was brought under control in the early 1920's by the parasite Prospaltella smithi. In recent years A. spiniferus became the most serious pest on the Island of Guam, but by 1953 introduced parasites had effectively controlled the outbreak. Trees heavily infested with this whitefly lose vitality and continued heavy infestation eventually leads to tree mortality. Injury occurs through feeding on the foliage and through formation of sooty mold which develops on the honeydew.

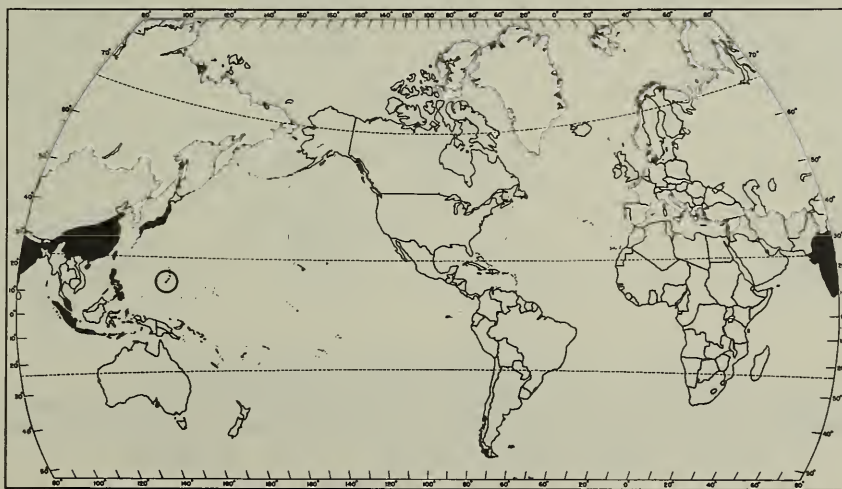


Infestation on Citrus Leaf
by A. spiniferus

Hosts: Citrus, rose, persimmon, grape, pear, Akebia sp., balmtree.

Distribution: Philippine Islands, China, India, Japan, Formosa, Indonesia (Sumatra, Java), Malaya and Guam.

Life History and Habits: Eggs are laid in spirals on lower surface of leaves, usually twelve or thirteen in a mass. Eggs are pale-yellow at first, then gradually darken. Incubation varies, depending on temperature, and averages 22 days in May; 7 in July. There are four immature instars. There are four broods a year at



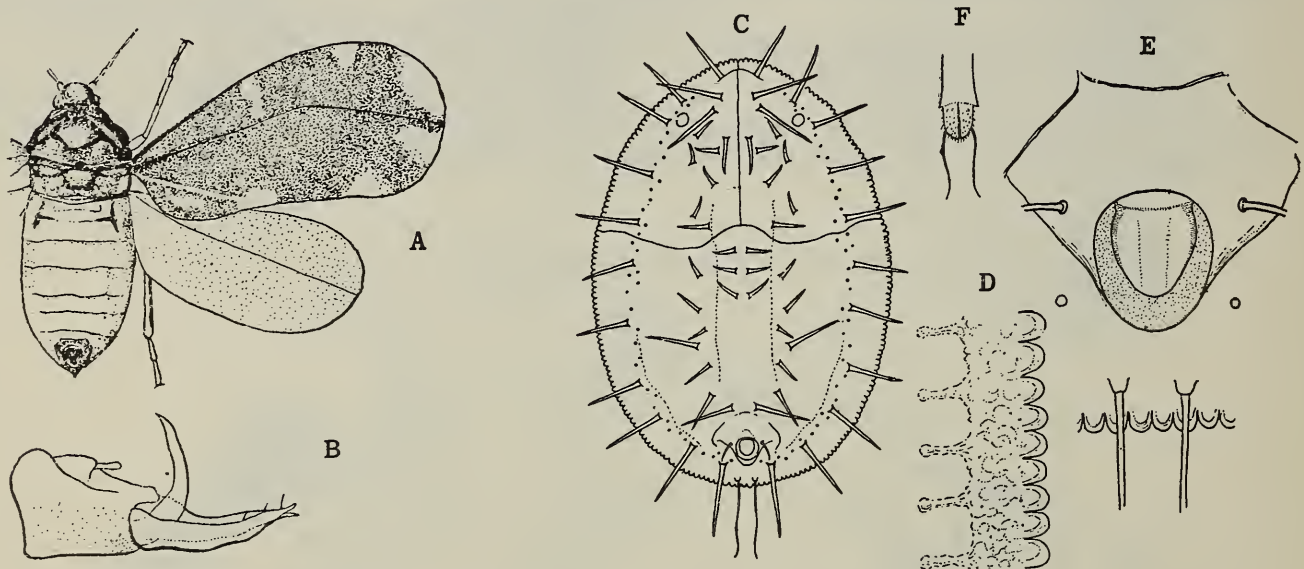
General Distribution of Aleurocanthus spiniferus

(Aleyrodidae, Hemiptera)

Nagasaki, Japan. The insect passes the winter in the third larval stage, reaching the pupal stage about the middle of March. Adults emerge from middle to the end of April. Adults of the second brood emerge the latter part of June, the third brood the first part of August and the fourth during the latter part of September. Adults are active on fine days but quiet during cloudy or rainy weather. They prefer new leaves and may be found on the underside of these.

Description: Female pupa is about 1.23 mm. long by 0.88 mm. wide, male pupa smaller than female. Black, convex, oval in outline, dorsum arched and median area prominent especially at the vasiform orifice. Vasiform orifice is elevated, subcordate, tending to circular and is almost entirely filled by the operculum. There is a submarginal even row of 22 spines averaging 0.22 mm. in length and extending beyond margin, a subdorsal row of shorter spines, and a submedian row of still shorter ones. Caudal margin with pair of setae and another pair is situated near cephalic margin of basiform orifice. Margin is strongly dentate. Dorsum without secretion but with a compact, short cottony fringe all around margin. Egg has short stalk holding egg upright on leaf. Exclusive of stalk egg 0.2 mm. by 0.1 mm., yellowish, curved and marked with minute polygonal areas. Larva is regularly elliptical, appearing brownish to black on leaf, with short cottony fringe of wax all around. Size, in second stage, about 0.4 by 0.3 mm. Adult is orange-yellow shaded with brownish-purple and sprinkled with white waxy powder. Female is about 1.35 mm. long.

The pupae of spiniferus differ from those of A. woglumi (citrus blackfly) in having narrower marginal teeth, and in the number, size and arrangement of the dorsal spines. The adults differ in the color pattern of the wings. (Prepared in Survey and Detection Operations in cooperation with other ARS agencies). CEIR 9(17):4-24-59.



Figures of Aleurocanthus spiniferus
A - Adult female; B - Male genitalia; C - Pupa case
(dorsal view); D - Margin of pupa case; E - Vasiform
orifice with caudal margin; F - Lingula

Figures (except map) from Kuwana, I. 1928. II. Aleyrodidae or White Flies Attacking Citrus Plants in Japan. Japan Ministry of Agr. and Forest., Dept. Agr. Sci. Bul. 1:41-78.

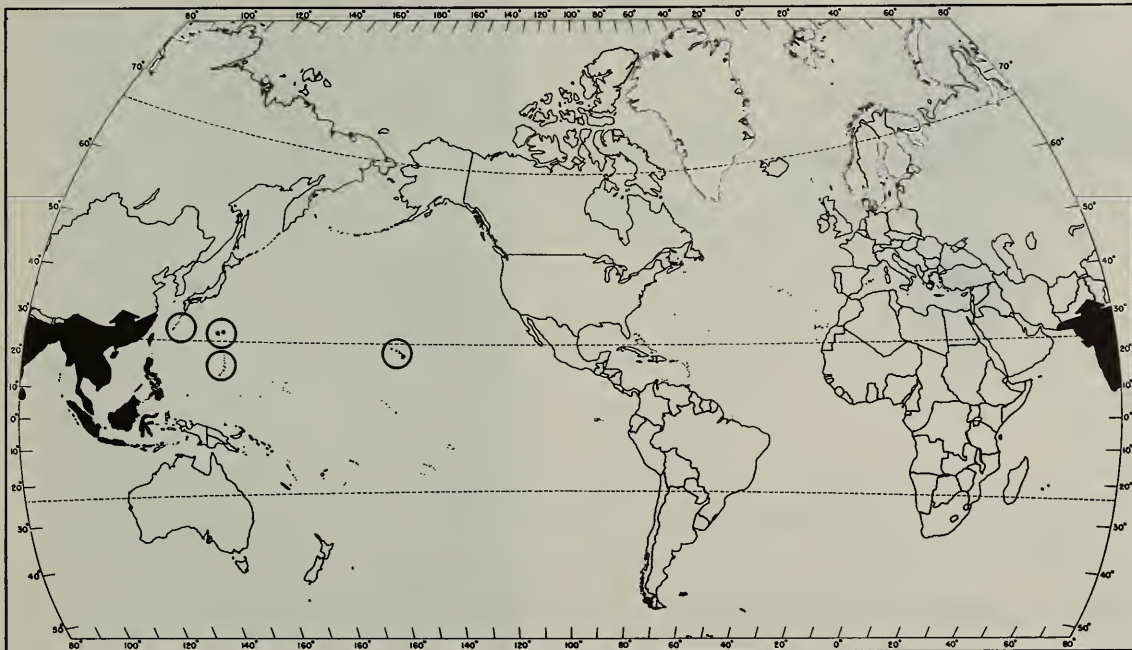
INSECTS NOT KNOWN TO OCCUR IN THE UNITED STATES

ORIENTAL FRUIT FLY (Dacus dorsalis Hendel)

Economic Importance: This fruit fly is regarded as the most destructive pest of fruit in many areas where it occurs. Infestations of 50 to 80 percent have been recorded in pear, peach, apricot, fig and other fruits in West Pakistan. It is the principal pest of mangoes in the Philippines and reportedly a serious pest of citrus in Formosa. Injury to fruits occurs through oviposition punctures and subsequent larval development. The insect was found to be established in Honolulu, Hawaii, in 1946. Within a short time it became very abundant and spread to all of the main Hawaiian Islands. The outbreak ruined most of the fruit, except pineapple, in that area. The Hawaiian infestation is believed to have been associated with troop movement during World War II. Following the discovery in the Islands, elaborate quarantine measures were established, both in Hawaii and on the Mainland, to prevent spread to the fruit areas of the United States. The pest has been intercepted on many occasions at ports of entry on the Mainland.

Distribution: Bonin Islands, Hawaiian Islands, Mariana Islands, and Southeast Asia (Burma, Ceylon, China, Formosa, India, Indochina, Indonesia, Malaya, Pakistan, Philippine Islands, Ryukyu Islands and Thailand).

Hosts: Attacks over 150 kinds of fruits and vegetables, including citrus, guava, mango, papaya, banana, loquat, avocado, tomato, Surinam cherry, rose-apple, passion fruit, peach, pear, apricot, fig and coffee.



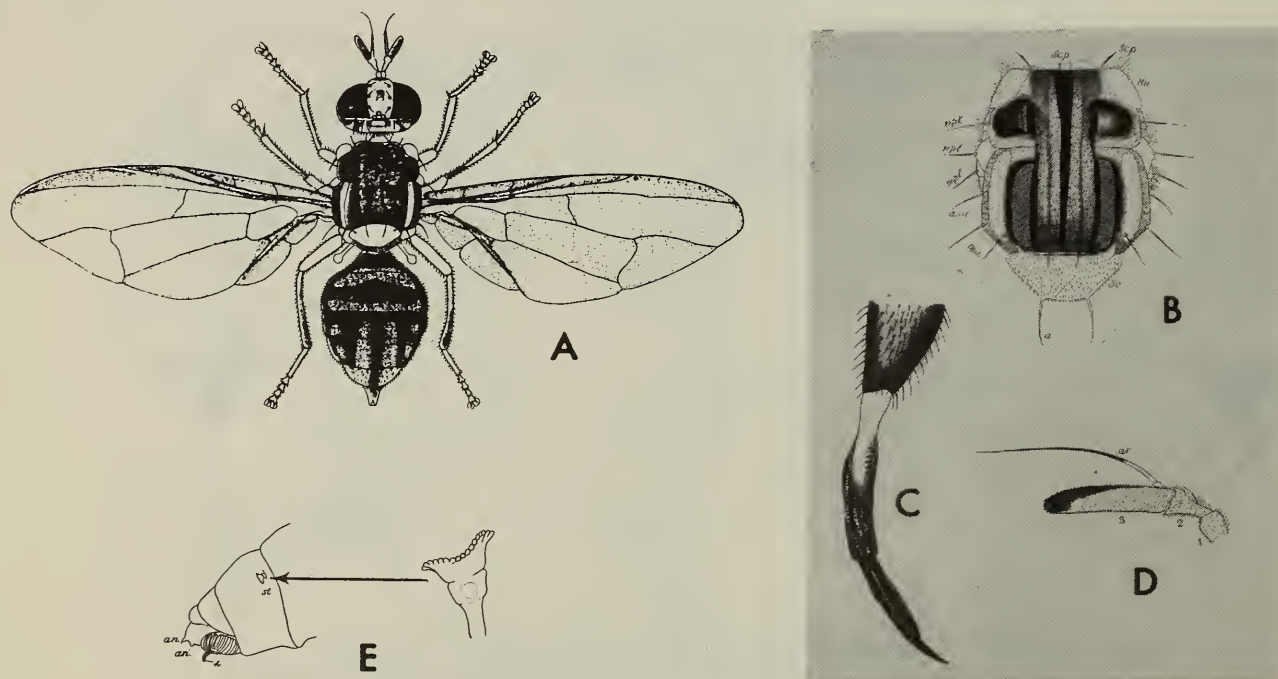
General Distribution of Oriental Fruit Fly

Life History and Habits: Observations in Hawaii show that development from egg to adult under summer conditions requires about 16 days. A period of about 9 days, during which essential nutrients are ingested, is required for attainment of sexual maturity after the adult flies emerge. The developmental periods may be extended considerably by cool weather. The eggs are inserted underneath the

skin of the host fruit after careful exploration by the female to find a suitable oviposition site. Lesions or breaks in the skin, as well as ovipunctures made by other fruit flies are frequently used for egg laying purposes. Ripe fruits apparently are preferred for oviposition, but immature ones may also be attacked. Generally, less than 10 eggs are laid at one time but the number may range up to one hundred or more. When provided with proper foods and water, individual females may lay more than 3,000 eggs during their lifetime. From 1,200 to 1,500 eggs per female is considered to be the usual production of this fruit fly under normal host and nutritional conditions it encounters in the field.

D. dorsalis greatly suppresses the numbers of C. capitata in areas where temperatures are favorable for rapid development of both species, as in many parts of Hawaii. Pupation occurs in the soil which the mature larvae enter after leaving decaying host fruits.

Description: ADULT - Considerably larger than house fly; 8.0 mm. body length, 7.3 mm. wing length, wing 2.8 mm. at broadest point. Color very variable but mostly yellow with dark markings on thorax and abdomen (see illustration). Generally, abdomen has two horizontal black stripes and a longitudinal median stripe extending from base of third segment to apex of abdomen. These markings may form a T-shaped pattern but the pattern varies considerably. Ovipositor is very slender and sharply pointed. Subapical bristles small and inconspicuous. Bristles extend less than half way to oviposition tip. EGG - Measures about 1.17 mm. by 0.21 mm., white, elongate, elliptical, chorion without sculpturing. Third-instar LARVA, which is of typical maggot appearance, is 10 mm. in length and creamy-white. PUPARIUM varies in color from tan to dark brownish-yellow. Length averages about 4.9 mm. (Prepared in Survey and Detection Operations in cooperation with other ARS agencies). CEIR 9(24):6-12-59.



Stages of oriental fruit fly (Dacus dorsalis): A - Adult female, greatly enlarged. B - Thorax, dorsal view. C - Ovipositor. D - Antenna. E - Anterior portion of larva showing enlargement of thoracic spiracle.

Figures (except map) from Maki, M., 1921. Investigations on the Orange Fruit Fly (Dacus ferrugineus dorsalis Hend.) in Formosa. Published by Bureau of Productive Industries. 271 pp., [Taiwan]. In Japanese.

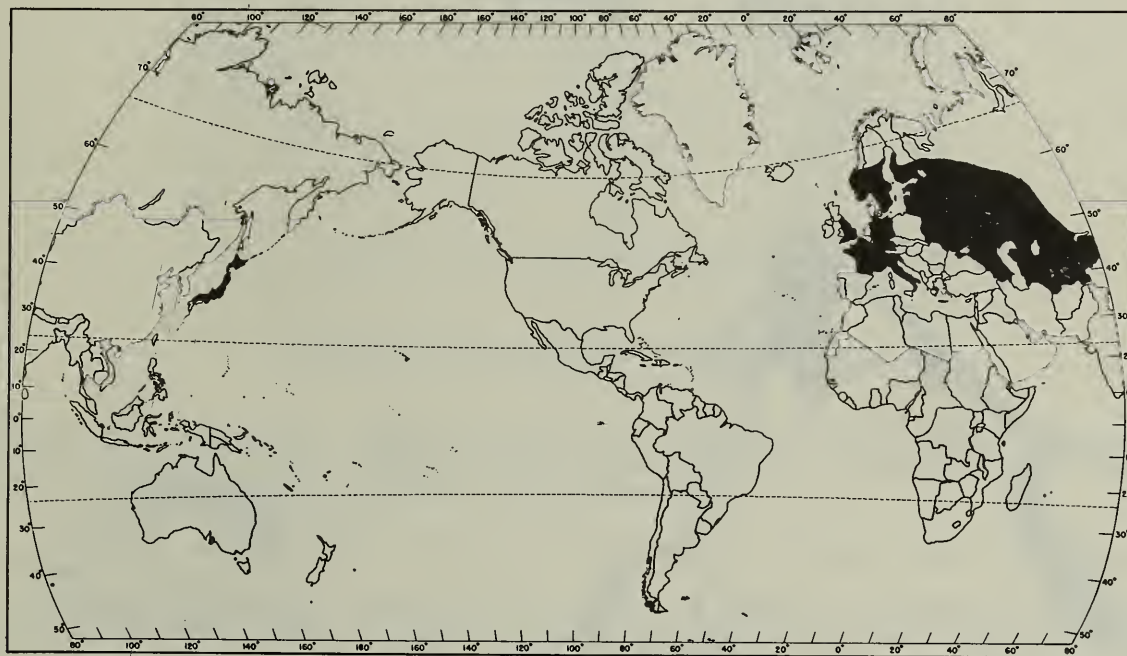
INSECTS NOT KNOWN TO OCCUR IN THE UNITED STATES

PLUM BORER (Rhynchites cupreus L.)

Economic Importance: This weevil causes damage to pome and stone fruits in many European countries and some areas of Asia. The overwintered adults feed on new growth, flowers and young fruit, but the greatest damage occurs from female oviposition punctures in young fruit and subsequent larval development. There seems to be a difference in host preference in different countries. In Germany, plums and cherries are the main hosts while in Finland the insect is mainly a pest of apple causing the greatest injury to the terminal shoots of young trees. It is also an important pest of apple in Norway and Sweden, injuring fruit as well as the young growth. Destruction of the shoots causes retardation and malformation in tree development.

Distribution: Most of Europe, USSR and Japan.

Hosts: Pome and stone fruits. Also reported from Sorbus spp., hazel, birch, hawthorn and grape.

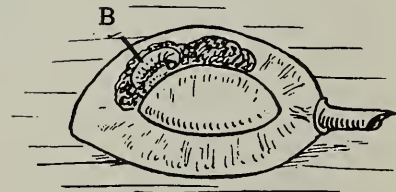
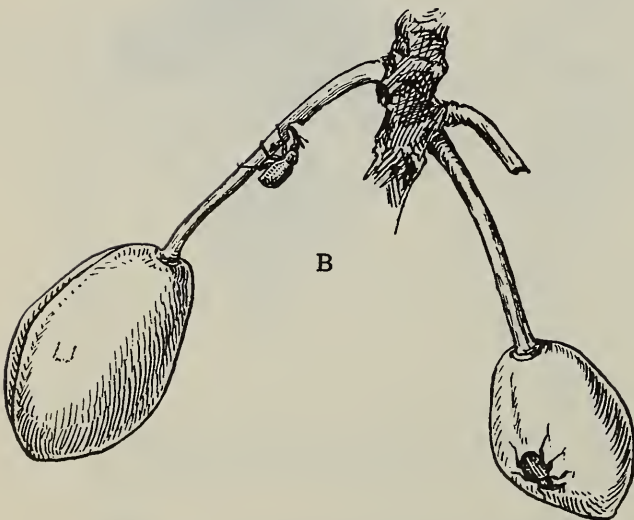


General Distribution of Rhynchites cupreus

(Curculionidae, Coleoptera)

Life History and Habits: Adults emerge from hibernation in early June and feed on new growth and young fruit. Females begin ovipositing by mid-June in first-year shoots and the young fruit. Oviposition takes place in cuts and punctures in the pedicels of the young fruit or in the tender shoots. One egg is deposited in each puncture and the female covers the cut with plant tissue. Hatching occurs in 4-11 days and the larva feeds in the tissues for 20-30 days. The infested fruit drops. Pupation takes place in the soil and lasts about 45 days. The young adults feed on the leaves of hosts before entering hibernation.

Description: Adult 3.5 to 4.5 mm., copper-brown in color. Larva white, curved, legless. (Prepared in Survey and Detection Operations in cooperation with other ARS agencies.) CEIR 9 (7) 2-13-59

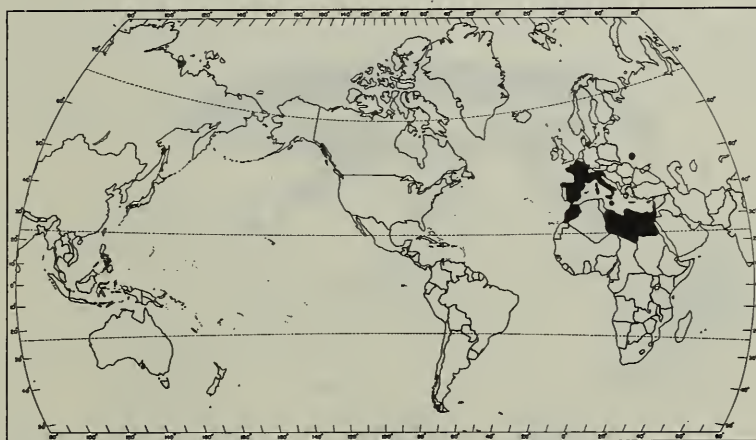


A - Adult of Rhynchites cupreus
B - Adult and Larval Damage

INSECTS NOT KNOWN TO OCCUR IN THE UNITED STATES

A BEET CURCULIONID (Lixus junci Boheman)

Economic Importance: Lixus junci is a curculionid pest of major importance on sugar beets in the Mediterranean Basin. Several other species of Lixus have been recorded as pests of beets, but L. junci appears to be the most important. Damage is caused by both adults and larvae. The adults feed on the leaves and stems, sometimes destroying young plantings, and the larvae make galleries in the roots which cause diminution and decay. Losses to the sugar beet crop have been estimated as high as 40 percent in Morocco and 50 percent in Israel. Unless control measures are applied in Israel, growers in that country can expect a 50-60 percent loss of the crop annually. Severe injury was caused to beets grown for seed in northwestern France in 1946, lambsquarters being the source of infestation.



General Distribution of Lixus junci

Distribution: Generally distributed in the Mediterranean region, being recorded in France, Spain, Italy, Israel, USSR (Kiev), Egypt, Libya, Morocco and the Islands of Sicily, Malta, Sardinia and Corsica.

Hosts: Attacks many plants; beets are the most important cultivated host.

Life History and Habits: Overwintering adults appear in early spring in Italy and feed on garden plants before migrating to roots of beets where they continue to feed before egg laying begins. The female makes a hole in the neck of the plant with her snout, inserts the egg and covers the hole with feeding debris. Very small plants are sometimes nearly cutoff, causing death of the plant. Frequently, however, eggs are laid in the petioles and midribs. Larvae hatch in 4-5 days, begin feeding on the petioles or the leaves and then penetrate the root, making long vertical galleries. Infestations are more severe in hot weather when the leaves remain small and most of the development of the insect takes place in the root. Two or three larvae may cause the whole upper part of a root to rot. After 30-60 days, pupation takes place in the galleries and new-generation adults emerge in 2-3 weeks. There are normally two generations a year, but a partial third generation is reported in Morocco. In Israel, the second generation which is heaviest and most dangerous starts from June to August.

(Curculionidae, Coleoptera)

Description: Adults are 8-13 mm. long, narrow and elongate, cylindrical, covered with easily removed, yellowish bloom, with white band on the sides of the thorax and elytra. Head and thorax rugose, snout about as long as thorax; elytra with rounded apex, 8 longitudinal rows of small striations; wings present. Egg is ovoidal, unsculptured, yellowish, and about 1.05 mm. long and 0.72 mm. wide. Mature larva about 10 mm. long and 3 mm. wide. Pupa is about 10 mm. long; tips of wing-pads reach posterior end of fourth abdominal sternite. Front legs extend almost to proximal margin of first tarsal segment of middle pair; middle pair extend to posterior third of fourth abdominal sternite. Head completely hidden from above by pronotum. Rostrum elongated and slender. Abdomen with eight distinct tergites; seventh largest and eighth smallest; total sternites 9. Seventh abdominal sternite with 2 large setae; eighth with 2 fleshy processes, each carrying 2 spines directed upwards. (Prepared in Survey & Detection Operations in cooperation with other ARS agencies.) CEIR 9 (4) 1-23-59.



Adult, Pupa and Larva of Lixus junci

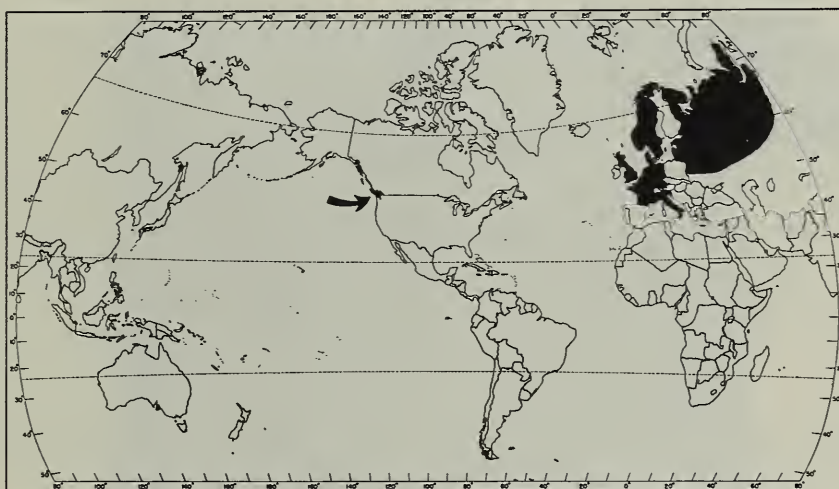
Figures (except map) from Bremond, P. 1938. Rev. de Path. Veget. et d'Entomol. Agr. de France 25(1):59-73.

INSECTS NOT KNOWN TO OCCUR IN THE UNITED STATES

A BRAMBLEBERRY LEAFHOPPER (Macropsis fuscula (Zetterstedt))

Economic Importance: An outbreak of this leafhopper was discovered on loganberry on Lulu Island, British Columbia, in 1952. It had not been reported previously from North America. Heavy infestations have occurred yearly since 1952 in the Lulu Island area causing considerable damage to various brambleberries through feeding on flowers and fruit and through heavy deposits of honeydew. The infestations have been difficult to control. Although the insect has been known to cause direct plant damage for some time, it assumed a more important economic status when it was shown to be the vector of the destructive Rubus stunt virus of Europe in 1953. This virus is not known to occur in North America.

Symptoms of Rubus virus on loganberry are as follows: New canes weak, short, thin, much more numerous than usual, giving bushy appearance. The following season weak canes generally fail to flower. Flowers on infected canes less numerous than normal and may be malformed, floral parts becoming foliar. Disease is progressive, plant becoming more stunted and bushy in successive years. On raspberry, best diagnostic characters are late development and shortness of laterals early in season.

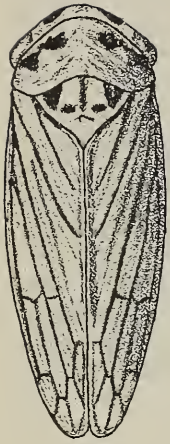


General Distribution of Macropsis fuscula

Distribution: Europe (Italy, France, Belgium, Netherlands, Germany, England, Denmark, Norway, Sweden, Finland, northern USSR) and British Columbia, Canada.

Hosts: Rubus spp. (loganberry, raspberry, thimbleberry, blackberry, et al.).

Life History and Habits: The insect overwinters in the egg stage in canes of wild and cultivated Rubus spp. In British Columbia, the eggs hatch in late May, about the time loganberries begin to blossom. Nymphs are numerous by mid-June, with as many as 7 per cluster of fruit buds in some plantings. There are 5 instars, each stage requiring about 10 days. Adults appear in mid-summer. Apparently there is only one generation a year. In the Netherlands, the virus is spread from old to new berry plantations by adults.



Adult



Male Genitalia

Description: According to Beirne - Length 4.5-5.0 mm. Dull yellowish-brown to light fuscous; markings of head, pronotum and scutellum black; veins of forewings fuscous or blackish. Distinctive features: black spot at base of hind tibiae; rounded or comma-shaped spot beneath each ocellus, a smaller spot beneath each of these; a large, elongate pair lower down and the sides of the clypeus black. Size of black markings and general color of insect variable. Other North American species having black-spotted tibiae may be readily distinguished from fuscula by the absence of dark facial spots and by host plants. (Prepared in Survey and Detection Operations in cooperation with other ARS agencies.) CEIR 9 (12) 3-20-59.

Macropsis fuscula



Left: Stunted

Right: Normal

Norfolk Giant Raspberry

Figures (except map): Adult and male genitalia from Beirne, B. P. 1956. Canad. Ent. 88(Suppl. 2), 180 pp. Stunted and normal growth of raspberry from Prentice, I. W., 1951. Jour. Hort. Sci. 26(1):35-42.

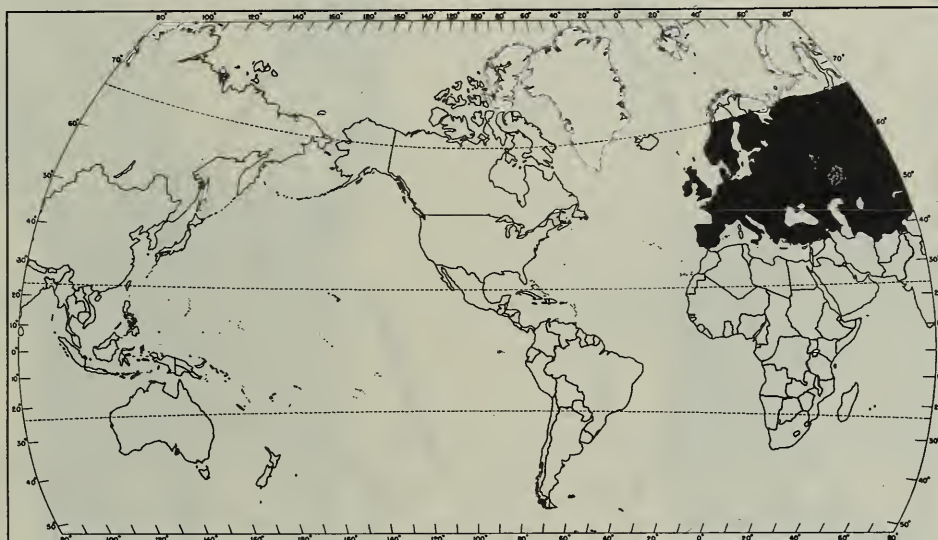
INSECTS NOT KNOWN TO OCCUR IN THE UNITED STATES

CABBAGE BUG (Eurydema oleraceum L.)

Economic Importance: This pentatomid is a very common pest of crucifers in most areas of Europe. Attacks have been very severe in outbreak years, hundreds of bugs being found on each plant at some locations. An attack can lead to the loss of the stand or severe stunting of the crop. Though crucifers seem to be the preferred hosts, damage to other crops, such as potatoes, has been recorded. There are numerous color varieties of this species within its general range of distribution, as well as several other species of Eurydema, but as far as known E. oleraceum appears to be the most important species in the genus in Europe. E. oleraceum has been intercepted several times at United States ports of entry in past years.

Distribution: Occurs throughout Europe, Turkey, Turkestan and areas of Siberia.

Hosts: A general feeder on crucifers. Also recorded on alfalfa, asparagus, beans, beets, cereals, clover, lettuce, gherkin, potatoes, Verbascum thapsus and ornamental plants.



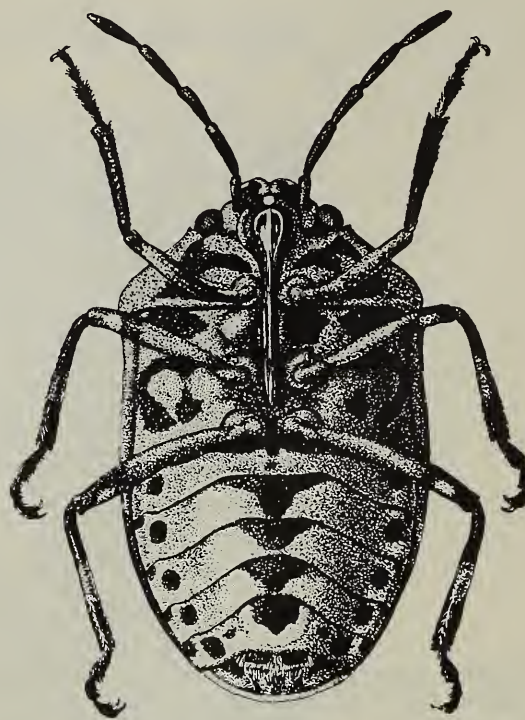
General Distribution of Eurydema oleraceum

Life History and Habits: The insect overwinters as an adult under lumps of earth, dead leaves or other debris. The adult leaves hibernation in the spring when the weather becomes sufficiently warm. They are very agile and jerky in their movements. They fly easily in the sunlight for considerable distances. Adults puncture the plant tissue, causing small yellow spots at each puncture. One bug may be responsible for a number of such spots. Damage is not great on old plants, younger plantings suffering worst. Several days after mating, the females begin to oviposit. They deposit from 4 to 6 batches of eggs over a period of time. Each batch is symmetrically arranged in two rows of 5 or 6 eggs each. Oviposition takes place on the underside of leaves and petioles. Incubation requires about 30 days. The young nymphs disperse over the plant and feed on the foliage. They pass through 4 or 5 molts, becoming adults in around 45 days. In France there is one generation a year.

Description: Adult 6-8 mm; head short, the lateral edges of the juga distinctly sinuate, edges of pronotum straight, the transverse groove lightly marked, color gun-metal blue. Some individuals have dark undersurfaces, some light. In the former, legs are black with a pale ring on the tibiae (less on the posterior except in the variety nigripes where all tibiae are black). In the individuals with pale venter, femora are largely pale at the base and all of the tibiae have a ring of the same color. The venter is ornamented mid-ventrally with various-sized black spots and with black spots on each stigma and on external anterior angle of each segment. There are numerous varieties of this species. They may be grossly divided as follows: (1) corium without spots, (2) corium with a pale spot near apical end, (3) corium with a spot occupying all of the apical part. Abdomen of nymph pale yellow, tinged with brown, with four central black bars separated by red lines; outside these a broad vinous red band running all round the abdomen. Legs ochreous, tibiae with black lines, femora with black rings; antennae four-jointed, black; no ocelli. Eggs are greenish-yellow with a uniform white operculum and characteristic barrel-shape. (Prepared in Survey and Detection Operations in cooperation with other ARS agencies.) CEIR 9 (6) 2-6-59



Dorsal



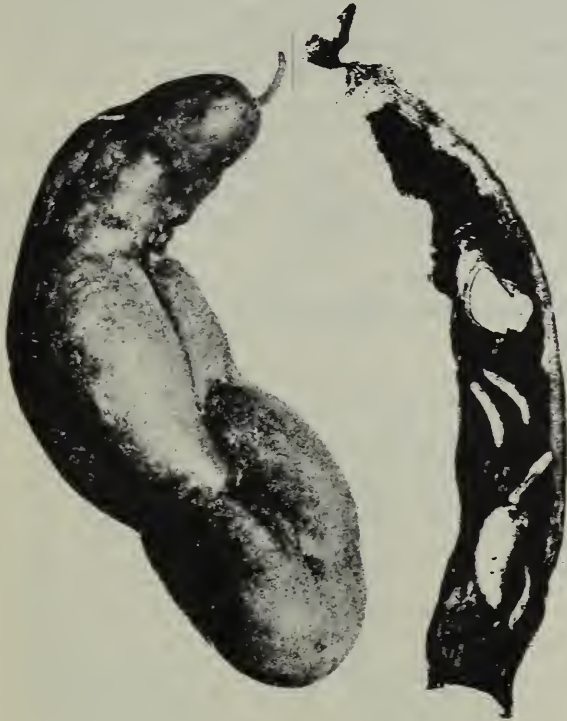
Ventral

Adult of Eurydema oleraceum

INSECTS NOT KNOWN TO OCCUR IN THE UNITED STATES

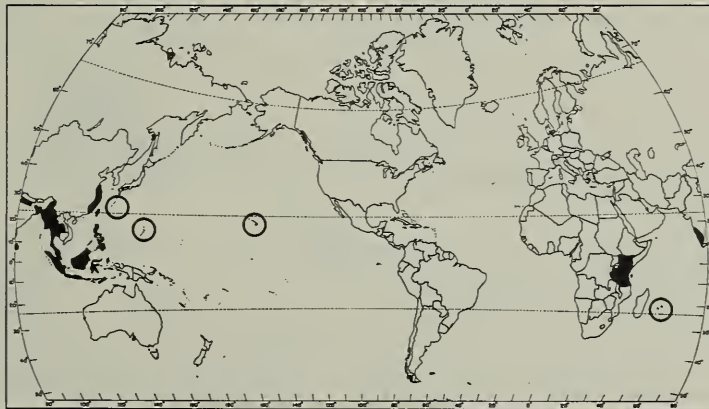
MELON FLY (Dacus cucurbitae (Coq.))

Economic Importance: This tephritid is considered the most important cucurbit pest of the Indo-Malayan region. Production of melons, cucumbers and tomatoes had been seriously curtailed in Hawaii, where the pest was introduced prior to 1900. Severe damage to beans and cowpeas has also been reported. By 1915, in that area, entire fields of watermelons were being killed before the plants were 6 to 8 inches tall. Infestation in flowers of hosts ran to 100 percent and more than 90 percent of the pumpkin crop was ruined annually. Serious loss on cucurbits also occurs in Formosa, southern China and Pakistan. Melon fly larvae feed in tender plant tissues such as terminals, fruits, flowers, young stems and roots, causing rapid destruction. This species has been intercepted at U. S. ports of entry on many occasions. One specimen of D. cucurbitae was taken in a bait trap in Los Angeles, California, in July 1956. Intensive surveys failed to reveal additional specimens, however.



Damaged Cucumber and Bean

Distribution: Africa (Kenya, Tanganyika), Mauritius, Burma, Ceylon, China, Formosa, Philippines, Malaya, Indonesia, Guam, Saipan, Tinian, Hawaii, Ryukyu Islands, Thailand, Sarawak, Timor, northern Australia (?), India.

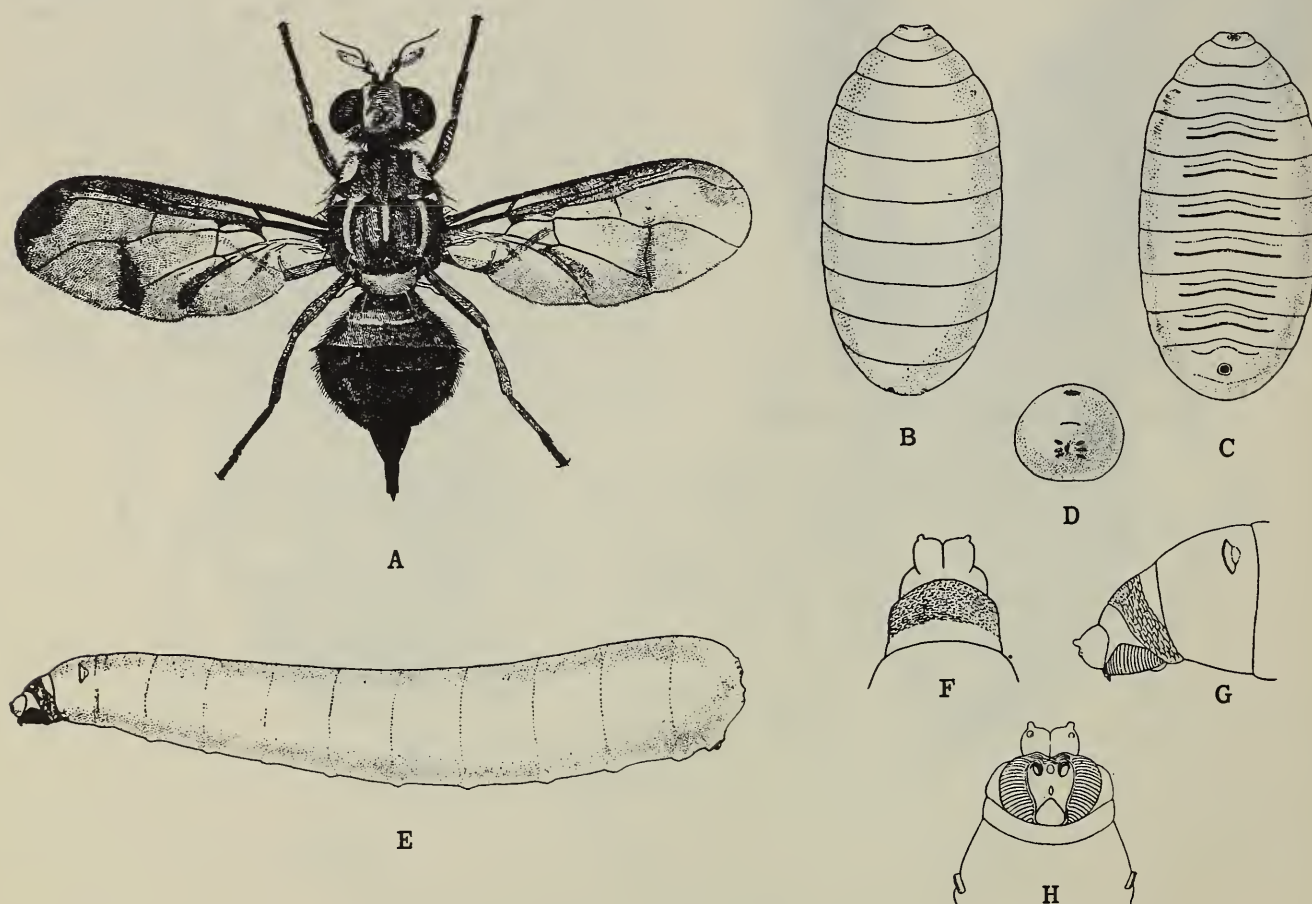


General Distribution of Melon Fly

Hosts: Preferred hosts include cucumber, cantaloup, watermelon, squash and other cucurbits as well as tomato, beans and cowpeas. May also be found in eggplant, fig, orange, papaya, mango and peach. More than 80 species of plants are attacked.

Life History and Habits: Adults feed on juices of host plants, nectar and honeydew of other insects. They are more numerous in crops and oviposition is greater in early morning and late afternoon. The eggs are deposited in groups of 1 to 30 in fruits, flowers, roots, stems or other tender tissue of hosts. On cucurbits the oviposition punctures exude a resinous material. Hatching occurs in about 26 hours. The young maggots feed and burrow in the tissues, causing rapid decomposition. Infested fruit has dead spots around punctures, and if growth continues the fruit becomes distorted. At the end of the third instar the larvae bore out of the fruit to pupate in the surface of the soil. Larvae at this stage have a peculiar habit of jumping after leaving the host. Pupation requires about 9 days in the summer. There are 8 to 11 generations per year in Hawaii. The females live for months, depositing eggs at frequent intervals.

Description: ADULTS - 6 to 8 mm. long, reddish-yellow. Head yellowish with black spots. Thorax and abdomen with yellow markings. Wings shiny, transparent, marked with brown spots. EGGS - White, slender, 2 mm. long. LARVAE - White, of typical maggot appearance. Full grown, 10 mm. long. PUPAE - 5 to 6 mm. long, elliptical, whitish to yellowish-brown. (see illustrations). (Prepared in Survey and Detection Operations in cooperation with other ARS agencies). CEIR 9(19): 5-8-59.



Stages of melon fly (Dacus cucurbitae): A - Adult female, greatly enlarged. B - Puparium, dorsal view. C - Puparium, ventral view. D - Puparium, showing posterior spiracles, oval depression and dark line marking on posterior portion. E - Third-instar larva, lateral view. F - Third-instar larva, dorsal view of anterior end. G - Third-instar larva, lateral view of anterior end. H - Third-instar larva, ventral view of anterior end.

Figures (except map) from Back, E. A. and Pemberton, C. E., 1917. U. S. Dept. Agr. Bul. 491, 64 pp.

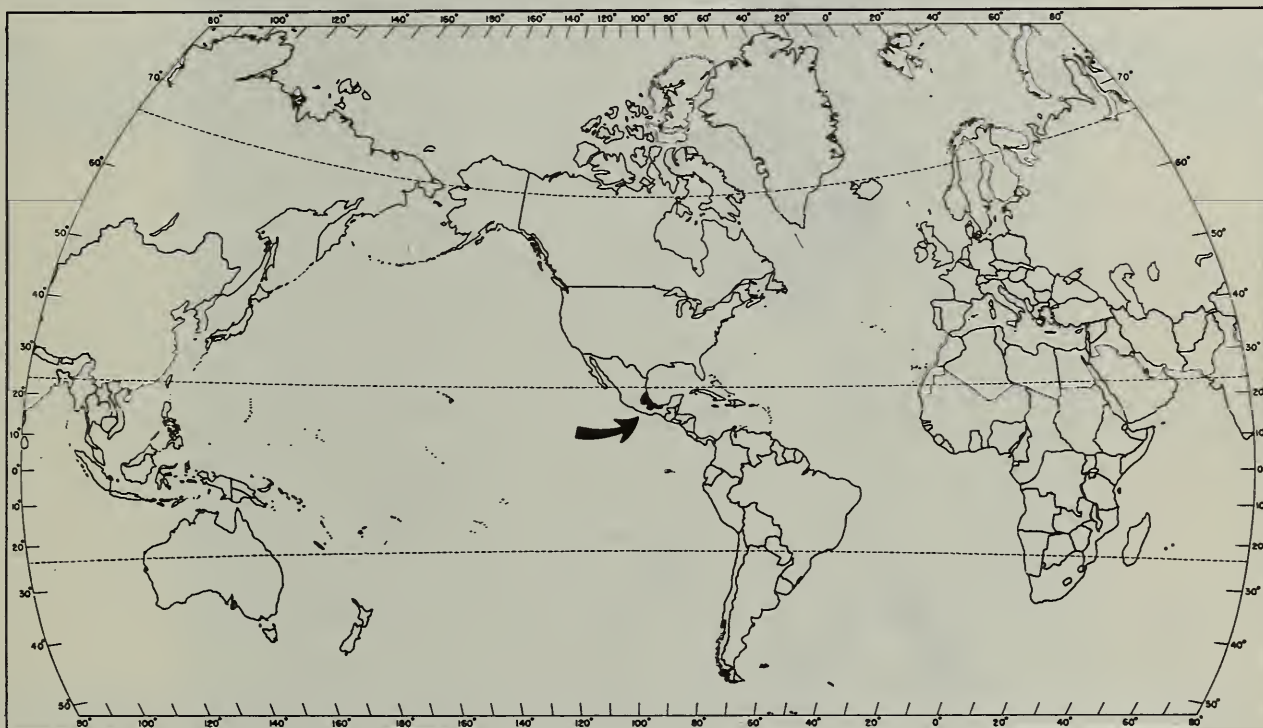
INSECTS NOT KNOWN TO OCCUR IN THE UNITED STATES

POTATO WEEVIL (Epicaerus cognatus Sharp)

Economic Importance: This insect is a pest of potatoes in the mountainous areas of several states of Mexico. The larvae cause severe damage to the tubers through their extensive feeding and tunneling. The species did not attract attention until 1922 when Mexican potatoes infested with it were intercepted at New Orleans. There have been many interceptions at ports of entry since that time.

Distribution: Mexico (Mexico City and States of Puebla, Tlaxcala, Veracruz, Hidalgo and Mexico).

Hosts: Potato and Solanum sp.



General Distribution of Epicaerus cognatus

Life History and Habits: Adults emerge from the soil in May and feed on potato foliage. The females oviposit in batches of 10-15 eggs each on the foliage several times between May and October. Oviposition is heaviest in July and August. Under normal conditions the egg stage lasts from 18-20 days. The newly-hatched larvae drop to the ground and enter soil in search of the potato tuber. Tubers have been found infested at depths of 8 inches. After feeding in the potatoes for 3-5 months, the larvae leave and form cells in the soil where they pupate the following March. The larval excreta is characteristic in appearance, resembling very small grains of corn. Infested potatoes may not show an entrance hole but presence of the insect is indicated by the softness of the tuber.

(Curculionidae, Coleoptera)

Description: The ADULT is slightly reddish, dark-coffee colored. Length 11 to 15 mm. Thorax broad, constricted behind, its dorsal surface very coarsely sculptured, usually with a broad irregular groove along middle. In this species, the channel on the middle of the thorax is deep, and the costae on the wing-cases are distinctly elevated even on the part where they all join. Males more slender than females. LARVA whitish with a dark head. It has no legs and moves by body contractions. A full-grown larva is about 15 mm. in length. The PUPA is white. (Prepared in Survey and Detection Operations in cooperation with other ARS agencies). CEIR 9(44):10-30-59.



Adult, Larva and Pupa of
Epicaerus cognatus and damaged potatoes

Major reference and figures (except map): Oficina Federal para la Defensa Agricola de Mexico. 1931. Principales Plagas y Enfermedades de los Cultivos en la Republica Mexicana. 378 pp., Tacubaya, D. F.

INSECTS NOT KNOWN TO OCCUR IN THE UNITED STATES

PUMPKIN BEETLE (Aulacophora hilaris (Boisduval))

Economic Importance: This chrysomelid is a serious pest of cucurbits over a large area of Australia. It is probably the outstanding pest of these crops wherever it occurs in the country. Considerable losses occur annually in New South Wales, particularly in early crops, but periodically a general outbreak occurs and most of the young spring crops are heavily damaged or destroyed. Replanting of the crop becomes necessary in some instances. There are several species of Aulacophora in Australia and many attack cucurbits, but A. hilaris is probably the species of the greatest importance. In New South Wales, A. hilaris is more prevalent in the inland areas of lower elevations and milder temperatures.

Distribution: Widely distributed in Australia, being recorded in Queensland, Northern Territory, South Australia, Victoria and New South Wales.

Hosts: Prefers cucurbitaceous plants, but will attack many other crops and wild plants including alfalfa, apple, beans, black nightshade, Carduus, cherry, corn, dock, Eucalyptus, fig, gooseberrygourd, grapevine, nectarine, peach, potato, pricklypear and sugarcane.

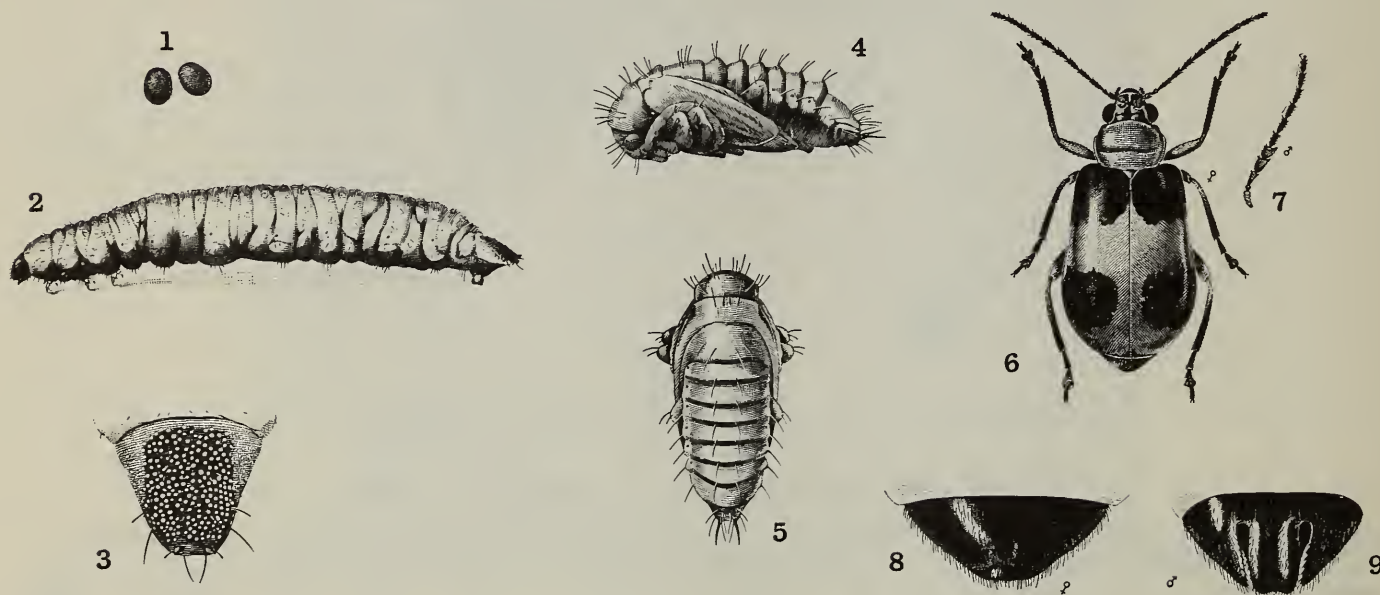


General Distribution of Aulacophora hilaris

Life History and Habits: Egg laying after overwintering begins in September (early spring). Females lay about 490 eggs each, depositing them singly or in small batches on dead leaves or on small clods of earth under the plants. Eggs hatch in 8 to 10 days in summer, up to 23 days in cooler weather. Young larvae feed on roots or tunnel stems just above the ground, or fruits in contact with the soil. Larval and pupal development each takes approximately 18 to 20 days. Pupation occurs in the soil, 1 to 6 inches below the surface, in fragile, earthen cells. Several generations develop annually. The average period from egg to adult is 50 to 53 days. The adults attack plants in all stages of growth, but chief damage is caused to young plants, especially those just above the ground; these may be destroyed by half-a-dozen beetles in a few hours. In older crops individual plants may be destroyed, but are usually able to outgrow the infestation. The flowers and young fruits of pumpkins and squashes may be attacked, causing additional losses. The average life of the adult is 194 days for the female and 157 days for the male; however, they may live as long as one year. Normally, adults will hibernate during the winter under sheltered conditions such as bark of dead trees, hollow trees, etc. Overwintering does not occur in the larval or pupal stage.

(Chrysomelidae, Coleoptera)

Description: ADULT - Elongate, broader posteriorly than anteriorly; female slightly larger than male. Color, bright orange with black markings. Each elytra marked with two prominent black patches, also sometimes slightly tipped with black. Terminal abdominal segment black, adjacent segment black except for small yellow band dorsally at each lateral margin. Eyes, tibiae and tarsi and ventral surface of each thoracic segment are dark-colored. Antennae dark except basal 5 segments in male, 2 basal in female, which are yellow. Antennae 11-segmented; simple in female, but 3rd to 5th basal segments enlarged in male. Abdomen 5-segmented. Terminal abdominal segment of male and female differ as illustrated. Length 7-8 mm. EGG - Bright orange when laid, later becomes paler, then yellowish-brown before hatching. Shell delicately reticulated. LARVA - Newly-hatched larva slender, light-brown in color. Mature larva 10-13 mm. long, yellowish-white to pale yellowish-brown. Head and thorax slightly narrower than abdomen. Head brown, antennae 3-segmented. Dorsal surface of prothorax shaded brown. Legs yellowish-brown, lightly bristled, tarsi with single claw. Anal shield of abdomen brown with numerous circular white pittings; four large pairs of setae on anal shield, first and third pairs clubbed, second and fourth aciculate; dorsoanteriorly to third pair of setae, pair of small papillae. Spiracles on second thoracic segment and each abdominal segment. PUPA - Generally resembles family characteristics. At first creamy white, later darkening. (Prepared in Survey and Detection Operations in cooperation with other ARS agencies). CEIR 9(15) 4-10-59.



Stages of pumpkin beetle (Aulacophora hilaris)

1. Egg. 2. Fully grown larva. 3. Anal shield of larva, dorsal view.
4. Pupa, lateral view. 5. Pupa, dorsal view. 6. Female, dorsal view.
7. Male antenna. 8. Last abdominal segment of female, ventral view.
9. Last abdominal segment of male, ventral view.

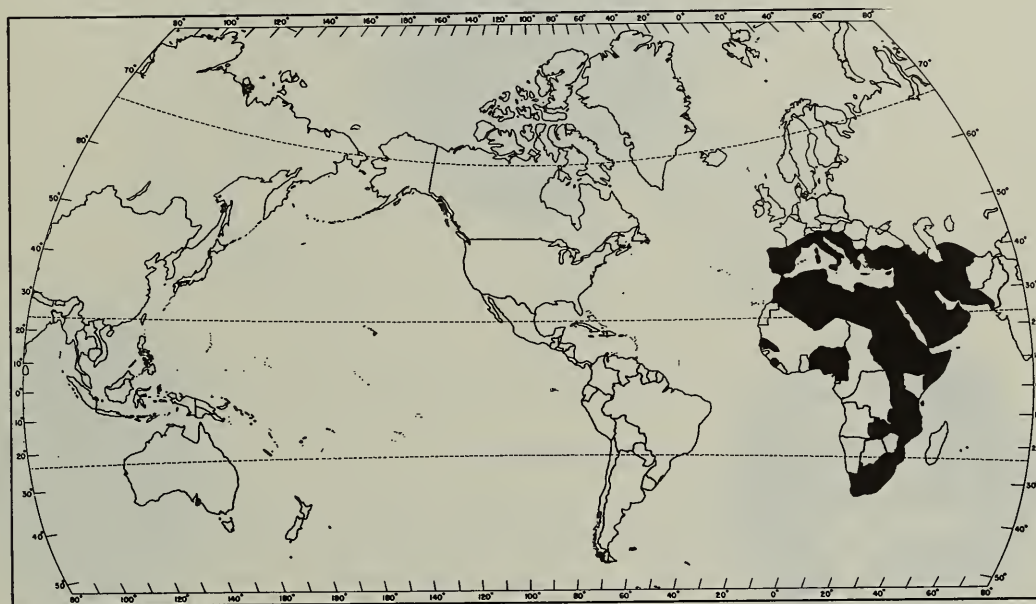
INSECTS NOT KNOWN TO OCCUR IN THE UNITED STATES

TWELVE-SPOTTED MELON BEETLE (Epilachna chrysomelina (F.))

Economic Importance: This coccinellid is rated second only to an armyworm (Prodenia litura) as a major pest of cucurbits in Egypt. Control measures are necessary in some years to save the crops, especially watermelon which is the favorite host. Considerable damage to melons also occurs in Algeria and other North Africa areas. In Israel and Jordan, serious losses occur on the plains but infestations are not serious in the hill regions where temperature seems to be a limiting factor. Heavy damage in untreated melon plantings was reported in 1957-58 from Iran. Infestations are seldom serious in consecutive years in South Africa and populations do not build up to damaging levels in France. Plant damage results from the feeding of larvae and adults on foliage, stems and fruits.

Distribution: Widespread in Africa, Southern Europe, Middle and Near East.

Hosts: Principally a pest of cucurbits including watermelon, muskmelon, cucumber, pumpkin and other cultivated and wild species. Also reported from cotton, sesame, lettuce and potato.



General Distribution of Epilachna chrysomelina

Life History and Habits: In Israel, adults emerge from hibernation in May. Eggs are laid in clusters of 50 or less on the lower surface of the leaves. Hatching occurs in 3 to 5 days and the larvae begin feeding almost immediately, making rows of transparent spots on the leaves. After 3 to 5 molts, pupation takes place on the plants or other nearby objects. There are 5 generations annually. Adult activity ceases at the beginning of the rainy season. Feeding continues through the winter on wild cucurbits in Egypt, however. During the crop season, both adults and larvae feed on fruits, leaves and other tender parts of hosts. The leaf tissue is consumed, leaving only the veins, much as with Mexican bean beetle. Injured leaves dry and plant mortality occurs in heavy infestations. Large holes are eaten in the fruits and young stems are gnawed. The adults fly actively and the larvae may migrate from plant to plant.

Description: ADULT - 8.6 by 5.8 mm., tawny or brownish-yellow, but color may vary. Each elytron has six black spots which vary in size. Integument covered with fine hairs. Antenna with 11 segments, first largest and nearly semi-circular in anterior part. Prothorax smooth, broad and convex; anterior portion with two large symmetrical projections which extend forward on each side of the broad head. Mesothorax light-brown to reddish-brown. Metathorax dark, first sternites with darker stripes running to the sides. EGG - Pale yellow, elongate oval, 1.45 by 0.5 mm. LARVA (newly hatched) - Light-yellow, back covered with tender spines. Full-grown larva broad, dark-yellow, nearly fusiform, branched spines strongly sclerotized; 6.4 by 4.2 mm. PUPA - Yellow to dark-yellow. (Prepared in Survey and Detection Operations in cooperation with other ARS agencies). CEIR 9 (33): 8-14-59.



Eggs, Adult and Larva of Epilachna chrysomelina

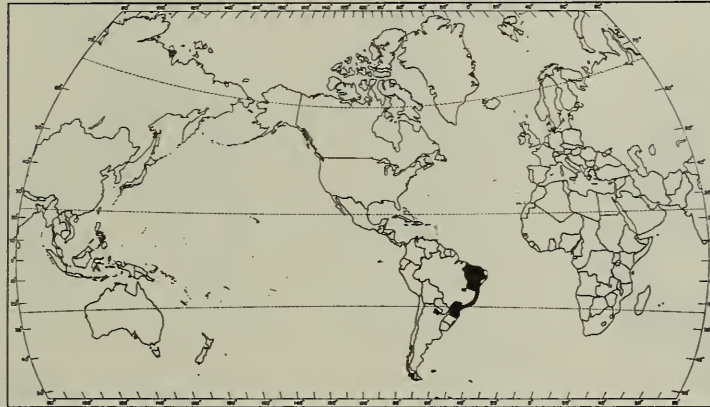
INSECTS NOT KNOWN TO OCCUR IN THE UNITED STATES

BRAZILIAN COTTON BORER (Eutinobothrus brasiliensis (Hambleton))

Economic Importance: This weevil has been known as a pest in Brazil since 1905, but in recent years it has become a major pest of cotton in that country. During the 1935-36 crop season in the State of Sao Paulo, it caused an estimated loss of about 30,000 tons. Early planted cotton is attacked first, infestations sometimes reaching 95 percent during the first three months of the season and plant mortality being estimated at 50 percent. A closely related species, Eutinobothrus gossypii (Pierce), occurs in Peru and Ecuador and attacks cotton in much the same manner as E. brasiliensis in Brazil.

Distribution: Eastern Brazil and the Chaco of Argentina.

Hosts: Occurs on cotton, okra, hibiscus, roselle, floss-silktree and numerous other species of malvaceous plants. Gossypium purpurascens is the species of cotton most severely attacked and G. trilobum the least.

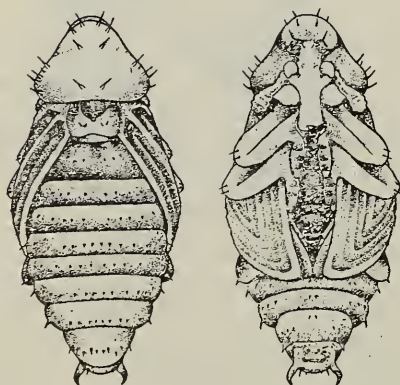
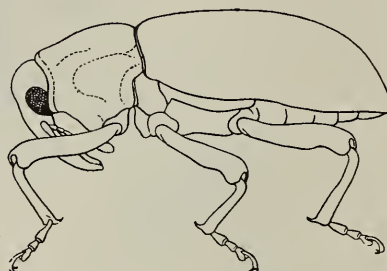
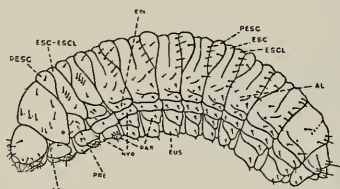


General Distribution of Eutinobothrus brasiliensis

Life History and Habits: Adults overwinter in trash or malvaceous weeds, but true hibernation has not been observed and oviposition may continue throughout the year where conditions permit. Overwintered females appear in September and October in Sao Paulo and oviposit until April, females of subsequent generations lay eggs through the crop season and the winter. Each female will lay about 160 eggs. Eggs are laid singly, in small cavities beneath the surface of the stem or root, and occasionally in the boll. The lower portion of the stem is preferred. Eggs hatch in 5-18 days and larvae bore into the center of the stem or root, often killing the plant. In older plants, larvae are almost entirely confined to the area between the bark and woody tissue. Feeding galleries run in all directions, often encircling the plant and causing death. In heavily infested plants, eggs are laid in aerial parts and larvae feed largely in the pith. Feeding in green bolls is limited to the pericarp. Larvae pass through 5 molts and complete their development in 29 to 88 days, varying with plant and temperature conditions. Infested plants may die rapidly or their foliage may turn reddish-brown in hot weather. Pupation takes from 8 to 31 days. The adult remains in the cell 3 to 26 days before emergence. Average development from egg to adult during the favorable season is 74 days. Adults feed first on stems and tender foliage of growing plants, later on stalks near the soil surface. All stages may be found throughout the year.

(Curculionidae, Coleoptera)

Description: Adult head and body dark blackish-brown, slightly brilliant. Antennae yellow-ferrugineous; scape smooth, attenuate in middle, dilated on distal half; funicle with 7 segments, first longest and thickest, second narrower, longer than broad, following progressively smaller. Eyes elliptical, depressed, shiny black, about one-third hidden by postocular lobe of prothorax. Rostrum pubescent, moderately arched, roughly punctate. Prothorax densely punctate, appearing grooved, anterior portion shiny, lateral lobes somewhat prominent, scutellum small, triangular. Elytra at least $2\frac{1}{2}$ times longer than thorax, lateral margins subparallel, each with 6 longitudinal stripes. (Stripes smaller than in E. gossypii.) Entire surface finely reticulate. Legs brownish-yellow; femur roughly grooved and with numerous spines or pale-yellow adjacent scales. All tibiae strongly unguate at extremities. Abdomen finely reticulate ventrally with fine punctures. Fifth abdominal sternite in male with extremity truncate; rounded and somewhat curved below in female. Total length 3.04 to 4.87 mm.; width 1.4 to 2.10 mm. Mature larva typically curculionid in shape; body color varies from white to cream, sometimes with reddish tinge; head characteristic yellowish-brown with borders slightly darkened. Length 5.83 to 7.04 mm.; width 2.14 to 2.54 mm. Pupa uniformly white at first, later turning cream colored. Length 3.90 to 5.77 mm.; width 1.87 to 2.61 mm. (Prepared in Plant Pest Survey in cooperation with other ARS agencies.) CEIR 9 (2) 1-9-59.



Larva, Pupa and Adult of E. brasiliensis

Figures (except map): Adult from Hambleton, E. J. 1937. Rev. de Entomologia 7(4):345-350. Larva and pupa from Hambleton, E.J. 1937. Inst. Biologico Arch. 8(4):47-106.

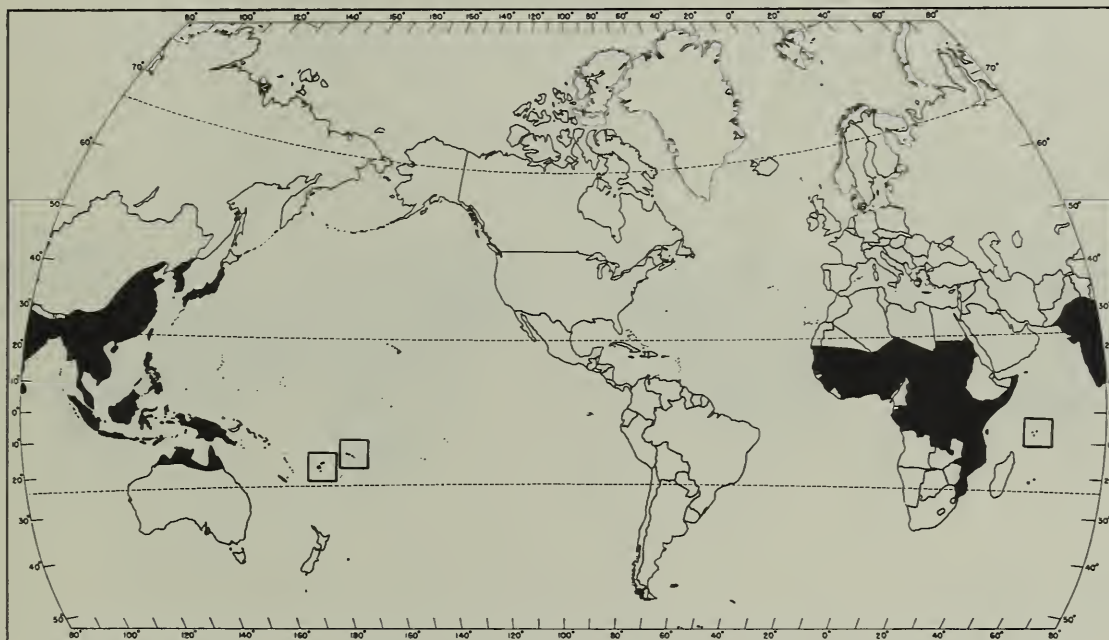
INSECTS NOT KNOWN TO OCCUR IN THE UNITED STATES

COTTON LEAF ROLLER (Sylepta derogata F.)

Economic Importance: This pyralid is generally distributed throughout the rain fed cotton-growing areas of Africa and Asia. The larvae are leaf feeders and may defoliate the plants to the extent that a serious check of growth results. In India, this insect is considered to be the most destructive foliage pest of cotton. The American varieties of cotton are more severely attacked than the native varieties. In Africa, outbreaks are usually controlled by parasites, notably species of Apanteles.

Distribution: Occurs throughout a wide area in Asia, Africa and on the Pacific and Indian Ocean Islands. It has also been recorded in Australia.

Hosts: Mostly confined to the Malvaceae, those most commonly recorded being Gossypium and Hibiscus esculentus.



General Distribution of Sylepta derogata

Life History and Habits: The females fly at night, laying eggs singly, or in groups, on either side of the leaf. The eggs hatch in about 3 days and young larvae wander a little at first, then congregate within a roll of leaf formed and secured by the threads they spin. When partly grown, they disperse and each forms a separate roll. In those varieties of cotton with a large leaf, the whole or a great part of the leaf is tied together and if the larva eats much of the base, the leaf withers. Smaller leaves may be completely destroyed by the larva. These folded leaves that are formed by the larva are fairly characteristic of the species. Larval development takes about 22 days and pupal development about 8 days. Pupation may occur in the rolled leaf or in debris on the ground. The cool season and subsequent hot, dry season may be spent as a resting larva. The total life cycle ranges from 3 to 7 weeks, depending on the area and climatic

(Pyralidae, Lepidoptera)

conditions. Several generations develop annually, as many as 4 being recorded in China. The larva of the last generation overwinters.

Description: EGG is smooth, somewhat flattened, yellowish-green. LARVA is up to 22-24 mm. long; greenish-white with a smoky tinge, semi-translucent; head dark brown, thoracic shield black with a dirty-white dorsal patch, thoracic feet black with a white ring. PUPA brown, 10-14 mm. long, having at its extremity eight straight spines with hooked tips. ADULT with light cream background; head and thorax dotted black, abdomen with brown rings, wings traversed by numerous brown or black wavy pencillings, with a black border and grayish fringe. (Prepared in Survey and Detection Operations in cooperation with other ARS agencies). CEIR 9(43):10-23-59.



Male and Female of Sylepta derogata

Adults - USDA photograph

Major reference: Pearson, E. O. 1958. The Insect Pests of Cotton in Tropical Africa. pp. 72-73, London.

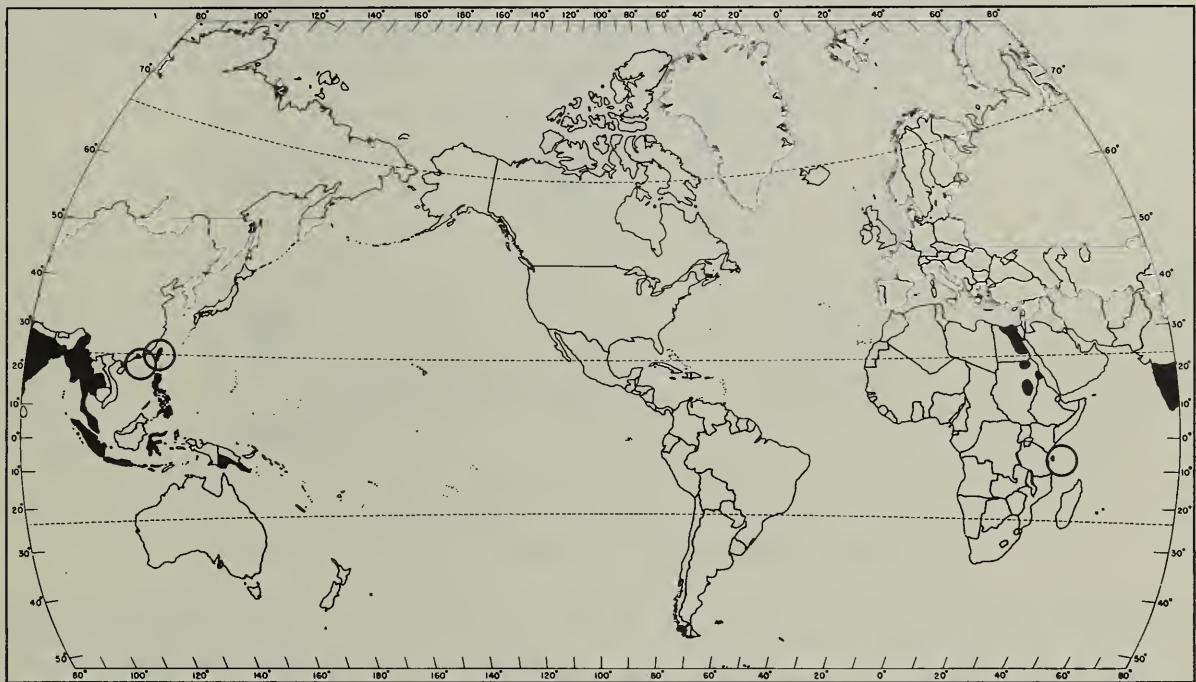
INSECTS NOT KNOWN TO OCCUR IN THE UNITED STATES

HIBISCUS MEALYBUG (Phenacoccus hirsutus Green)

Economic Importance: This mealybug is a troublesome pest on many plants in Egypt. Reports indicate it is one of the worst pests of cotton in North Bihar, India, where infestations hamper cultivation. Hibiscus in the Philippines is severely attacked. The insect feeds on a wide range of plants, principally on the growing terminals where it may cause severe deformity.

Distribution: Asia (India, Philippine Islands, Formosa, China (near Hong Kong), Pescadores Islands, Burma, Indonesia, Malaya, Pakistan, Thailand); Africa (Egypt, Sudan, Zanzibar) and New Guinea.

Hosts: Attacks many plants. Some of the most important are hibiscus, cotton, mulberry, guava, albizzia, peanut, beans, grape, quince:



General Distribution of Phenacoccus hirsutus

Life History and Habits: Females seek shelter in cracks and crevices on host plants to lay eggs. In such places several individuals congregate forming a colony. The ovisac increases in size while the female becomes smaller until she dies leaving an elongated ovisac full of shiny pink eggs. Each ovisac contains from 150-300 eggs. The egg stage lasts about 6-9 days, with hatching sometimes occurring before the last eggs are laid. The young larvae are very active leaving the ovisac soon after hatching for sites of new growth where they settle and start feeding. They molt twice before becoming adults. In Egypt there are about 6 generations a year. Reproduction is mostly parthenogenetic. Males are scarce in summer.

(Coccoidae, Hemiptera)

Description: ADULT female: length 2-3.5 mm., breadth 0.9-2 mm., slightly elongate and ovate, body pink to dark violet, sparsely covered with white secretion through which body color shows. Legs same color as body. No marginal wax filaments but there are one or two pairs at posterior extremities. The waxy threads composing the ovisac are brittle and easily broken when stretched on the tip of a needle. Absence of marginal filaments distinguishing characteristic of this species. (Prepared in Survey and Detection Operations in cooperation with other ARS agencies). CEIR 9(46):11-13-59.



Figures of *P. hirsutus*, adult female; a, posterior apex of body, showing cerarii, glands, anal ring, apical setae and ventral chitinized area; b, tarsal claw; c, cerarian spine; d to g, four different types of gland pores found on body; h, antenna.

Major reference:

Beshir, M. and Hosny, M. 1939. Minist. Agr., Egypt. Tech. and Sci. Serv. Ent. Sect. Bul. 209, 16 pp.

Figures (except map) from Morrison, H. 1920. Philippine Jour. Sci. 17(2):147-202.

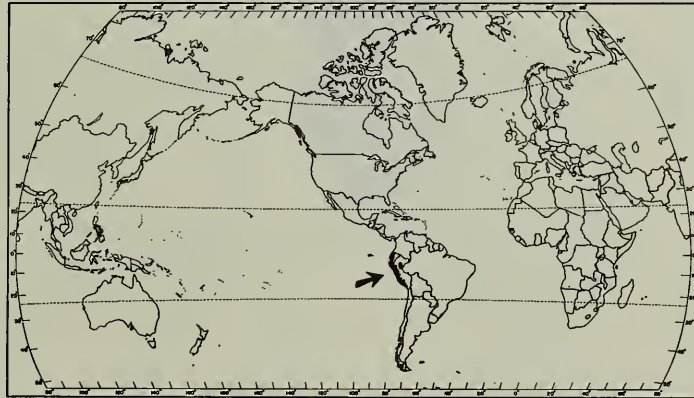
INSECTS NOT KNOWN TO OCCUR IN THE UNITED STATES

PERUVIAN BOLL WEEVIL (Anthonomus vestitus Boheman)

Economic Importance: This curculionid, which is similar in appearance to the boll weevil (Anthonomus grandis), is a major pest of cotton in Peru. Up to 75 percent of fallen squares often show damage by this weevil. The weevil was first discovered in 1853 on the island of Puna in the Gulf of Guayaquil, but 57 years lapsed before specimens were recovered in the Department of Piura in northern Peru.

Distribution: Occurs in all coastal valleys of Peru and Ecuador and in the districts of Huallaga and Mayo Rivers in the Province of San Martin.

Hosts: Attacks cotton and other malvaceous plants including Althaea rosea, Hibiscus rosa-sinensis, Cienfuegosia heterophylla and Sida panniculata, although complete larval development has not been reported in the last mentioned host.

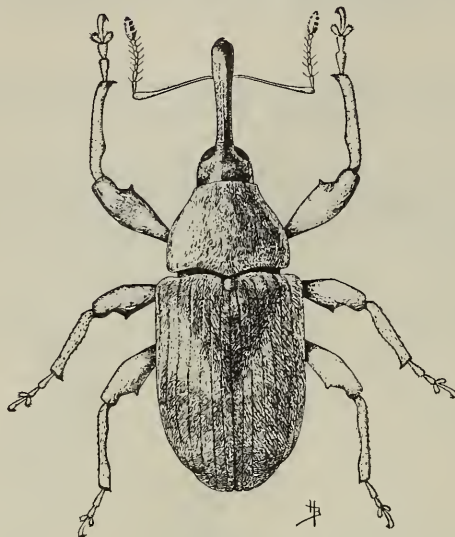


General Distribution of Anthonomus vestitus

Life History and Habits: The adults feed on the terminal buds and tender leaves, making small perforations unless feeding on pollen, then deep perforations are made. Deep perforations are also made by the female to lay eggs within the squares or buds. Damaged squares open their bracts, become yellowish, turn dry and generally drop to the ground, but sometimes remain on the plant. In more mature cotton, eggs may be deposited in older squares, thereby requiring emergence to take place from young bolls. Generally one egg is deposited in a square, but up to 8 may be found. Eggs hatch in 3-4 days and larvae begin feeding on pollen and ovaries of the square. After 4 molts and 3-4 weeks, pupation occurs and adults emerge in 5-12 days. The adults are long-lived, feeding up to 243 days without losing reproductive power. The life cycle from egg to adult lasts 4 to 6 weeks in good weather, but accelerates in hot, humid weather. During a year, 4 to 6 generations may be found, depending upon climate and food. In the central zone of the Peruvian coast, adults appear in October-November, egg-laying begins in December and maximum development occurs late in December and early January. December and early January is also the period of greatest losses since it is the period of most intense attack. Because of longer hours of sunlight and higher temperatures from January to March, populations decrease, but in April and May they increase again. Damage at this time is very noticeable because of the scarcity of squares. Oviposition ends in June. Diapause occurs only in areas of greatest heat and drought.

(Curculionidae, Coleoptera)

Description: The adult of A. vestitus resembles A. grandis somewhat, but it is a great deal smaller. Length of A. vestitus, 2.5 to 4 mm. Adults are oblong-ovate, convex, blackish piceous, rather closely clothed with elongate whitish scales, with indistinct oblique lighter band on each elytron, the two forming a basal triangle. When newly emerged, adult yellowish. Probosis long. Eggs oval, white. Larva white, curved, legless. Pupa white. (Prepared in Survey and Detection Operations in cooperation with other ARS agencies and the United States National Museum). CEIR 9(13) 3-27-59



Adult Male of Anthonomus vestitus

INSECTS NOT KNOWN TO OCCUR IN THE UNITED STATES

PINE LOOPER (Bupalus piniarius (L))

Economic Importance: Destructive outbreaks of this geometrid occur periodically in pine forests of Europe. Such infestations in Sweden in 1944 and in the British Isles in 1953 warranted aerial treatment. These were the first instances of aerial treatment against a forest defoliator in either country. One of the worst outbreaks (1892-96) on the Continent was responsible for destruction of pine forests on over 900,000 acres. Infestation development in some countries seems to be favored by areas of low rainfall or extended periods of drought. Trees in the 25-50-year-old range are generally most heavily infested.

Distribution: Most of Europe.

Hosts: Pinus spp. Attacks other conifers only in exceptional cases.

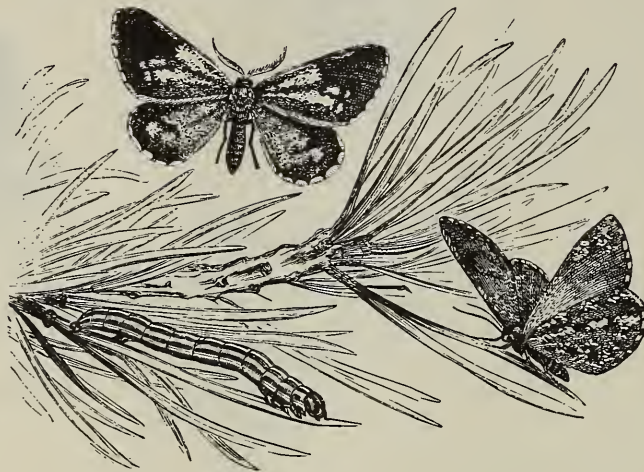


General Distribution of Bupalus piniarius

(Geometridae, Lepidoptera)

Life History and Habits: Moths are active in May and June in Britain. They fly during the day. Eggs are deposited on the underside of pine needles in a line parallel to the long axis. The larvae feed on foliage throughout the summer into autumn then drop to pupate in the soil or debris.

Description: Expanse about 30-37 mm. Color variable. Male - lighter ground color. Wings whitish, or pale ochreous. Forewings with dark-olive brown markings including tip and inner margin. Hindwings with costa, hind margins and two transverse lines of same color. Female - darker ground color. Wings dull-orange with hind margins and transverse band reddish-brown. Sexes similar in shape, abdomen of female much stouter. Larva green with three white lines on back and a yellow stripe on sides, 27-30 mm. Head and feet are greenish, a distinguishing characteristic of the species. (Prepared in Survey and Detection Operations in cooperation with other ARS agencies). CEIR 9(20) 5-15-59.



Adults and larva of Bupalus piniarius

Figures (except map): Larva and adults from Tashenberg, E. P., 1884. Die insecten, tausendfussler und spinnen. Brehms Thierleben Allgemeine Kunde des Thierreichs. 2nd. Ed. Vol. 1 (Leipzig) 711 pp.

INSECTS NOT KNOWN TO OCCUR IN THE UNITED STATES

PINE PROCESSIONARY MOTH (Thaumetopoea pityocampa (Denis & Schiffermuller))

Economic Importance: This defoliator is a serious pest of pine forests in Italy, Spain and Switzerland. Outbreaks have been reported also from other countries including Yugoslavia and France. The night-feeding larvae often cause complete defoliation of infested trees. Trees weakened by T. pityocampa are frequently attacked by bark beetles. Outbreaks may involve whole forests but do not usually last more than two years. The larvae are capable of producing cases of severe urtication in humans.



Defoliated Pine

Distribution: Southern Europe, Syria, Turkey.

Hosts: Pinus spp.

Life History and Habits: South of the Alps, moths emerge at end of June or beginning of July. The females deposit from 100-150 eggs around a cluster of 2 or 3 pine needles, forming a cylinder. The eggs hatch in about 4 weeks and larvae begin feeding on the foliage. Feeding takes place at night. The caterpillars are gregarious and move about in processions of single or double rows. They spin a tough, conspicuous web on the branches

in which they retreat during the day and in which they hibernate. The larvae molt 3 times; once in autumn, twice in spring. In May, the caterpillars cease feeding and descend the trunks in processions to pupate in the ground.



General Distribution of Thaumetopoea pityocampa

(Thaumetopoeidae, Lepidoptera)

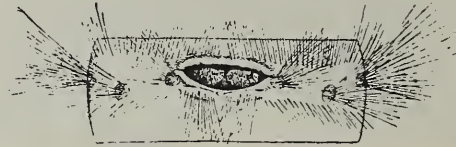
Description: ADULT - Male wing expanse 30 mm., female 35 to 40 mm. Body of moth yellowish with segments bordered transversally with brown bands. The front of the head is ornamented with a chitinized protuberance formed like a cock's comb. Forewings are dirty gray traversed by dark bands. Fringes are spotted. Hindwings white, each with a small deep gray spot on posterior edge. LARVA 30 to 40 mm., blackish on the back, yellowish on the ventral side with red-brown spots arranged on the upper part and the sides. Each segment carries tufts of yellowish hairs. (Prepared in Survey and Detection Operations in cooperation with other ARS agencies and the U. S. National Museum). CEIR 9(50):12-11-59.



A



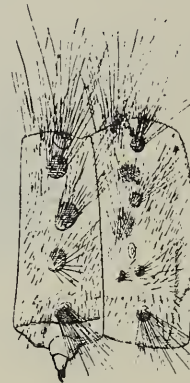
B



C



E



D

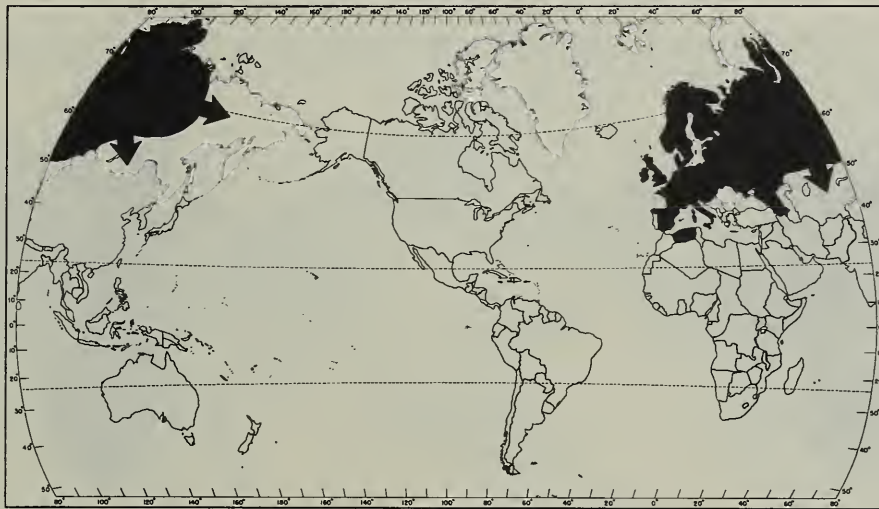
Figures of Thaumetopoea pityocampa: A - Typical mass of larvae in a web. B - Adult. C - Second abdominal segment of larva, dorsal view. D - Third thoracic and first abdominal segments of larva, lateral view. E - Deposit of eggs (without protective covering).

Figures (except map): Egg mass from Cuellar, A. R. 1956. Organizacion de la Lucha contra la Procesionaria del Pino. Minist. Agr. (Madrid) Ser. B., No. 3, 23 pp. Adult, also larval characters from Silvestri, F. 1911. Dispense di Entomologia Agraria (2nd Ed.). 575 pp., Portici. Pine defoliation and closeup of larvae in web - USDA photographs.

INSECTS NOT KNOWN TO OCCUR IN THE UNITED STATES

PINE SAWFLY (Diprion pini (L.))

Economic Importance: This diprionid is of considerable economic importance as a sporadic defoliator of pines in Europe. Outbreaks may become very severe and completely defoliate relatively large acreages of pines when conditions are favorable. In September 1948, a severe outbreak in Scotch pine in eastern Spain defoliated areas that measured up to $4\frac{1}{2}$ by $1\frac{1}{2}$ -2 miles. In most areas, however, only a small percentage of pines defoliated in one year are killed, but the trees may die if defoliated for 2 successive years. Damaged trees also seem very susceptible to attack by several species of weevils. Damage appears to be most serious in trees on impoverished sites with sparse vegetation or in young trees from 4 to 8 years old. Needle damage will vary from 60 to 100 percent on the edges and in thin parts of the forest to 30 percent or less in the dense parts.



General Distribution of Diprion pini

Distribution: Occurs throughout most of Europe, Algeria and through Siberia.

Hosts: Attacks most pines, but apparently prefers Scotch pine. Will also attack spruce and fir.

Life History and Habits: The biology is nearly the same for all species of the genus. In France, under normal conditions, adults emerge in April. Females deposit eggs in rows in pine needles in slits cut by the saw-like process of the female. Young larvae begin to feed in May on the previous year's growth. Larvae start feeding on the needle near the tip and work downwards, eating about 5 mm. at a time. The attack continues into June with pupation occurring on the branches. A second generation appears in July. The larvae feed to the end of the summer, then enter hibernation under cover or in the soil. Overwintering larvae do not pupate until 2 or 3 weeks before emergence in the spring. The larvae molt 5 or 6 times. They are often found in colonies, principally when most of the foliage has been devoured on a branch. In the colder climates of Germany, Scandinavia and USSR, only a single generation may develop.

(Diprionidae, Hymenoptera)

Description: ADULT - Wing expanse of the male is 16 mm., female 18 mm. The male is black, with apex of abdomen reddish and white spots on the underside of the first segment; antennae pectinate. The female body is dull yellow, with three dark areas on thorax and middle of abdomen black; antennae serriform; legs are yellow and wings have dusky borders, which are not noticeable in forewings of male. Newly emerged females of D. pini can be distinguished from D. similis, an important, introduced species that occurs in the United States, as follows: Tip of abdomen yellow in D. pini, greenish-blue in D. similis. LARVA - Pale green at first, almost whitish beneath, and with black feet. As larva matures, body color becomes dull brownish-green with dusky marks above prolegs and with dark brown head; feet are yellow with brown line at base. Full-grown larva is about 25 mm. long. COCOONS are variable, some being dark, others dull brownish-gray. (Prepared in Survey and Detection Operations in cooperation with other ARS agencies and the U. S. National Museum). CEIR 9(35) : 8-28-59.



Adults of Pine Sawfly

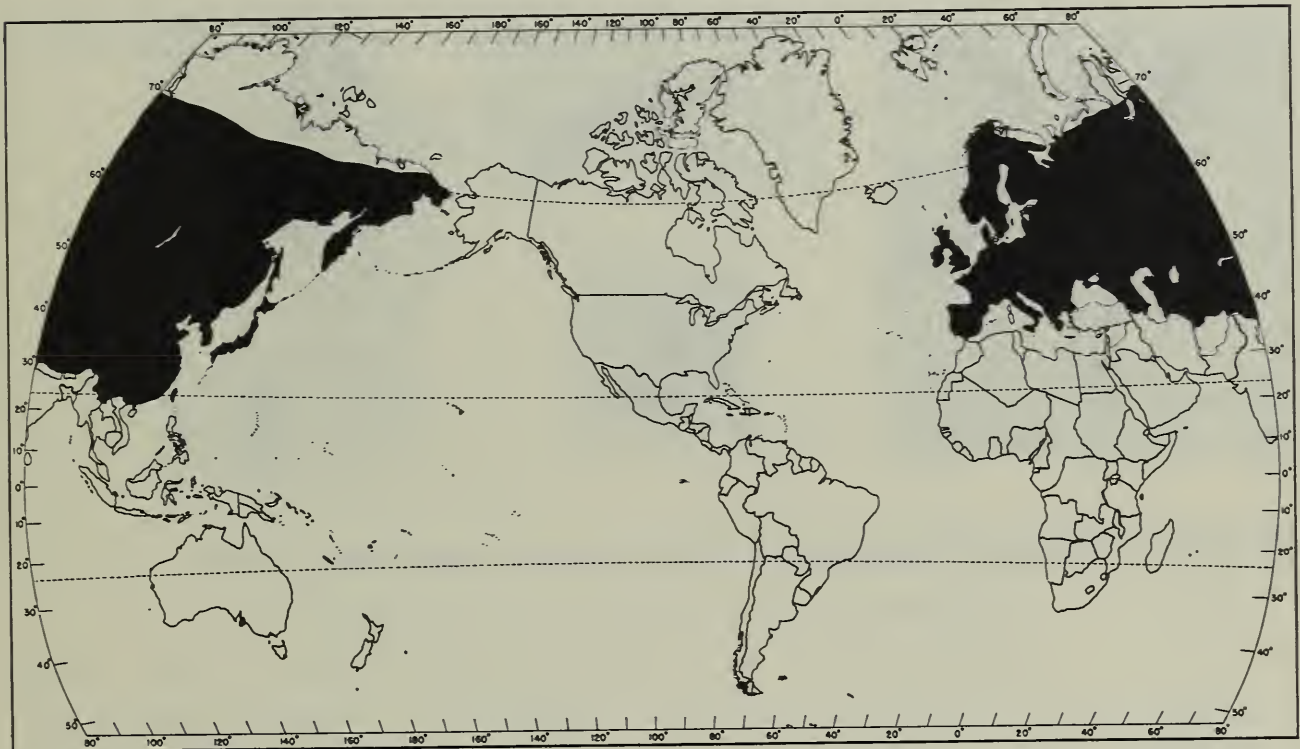
INSECTS NOT KNOWN TO OCCUR IN THE UNITED STATES

RED-TAIL MOTH (Dasychira pudibunda (L.))*

Economic Importance: This general defoliator is one of the most widespread pests in deciduous forests of the U.S.S.R. Severe outbreaks have been recorded in that country and in Germany and Sweden. Beech is a preferred host and reports of damage are generally associated with beech-forest areas. Many hosts are attacked, however, including deciduous fruits, hops and roses. Since the species feeds rather late in the season, defoliation of forest trees in any one year is not too serious, but repeated outbreaks may lead to severe damage. Cases of severe urtication in humans and cattle have been reported in outbreak areas.

Distribution: British Isles, through Europe and most of Asia.

Hosts: General feeder on many plants, especially deciduous forest trees and shrubs.



General Distribution of Dasychira pudibunda

Life History and Habits: Moths emerge at the time leaf buds begin to open. The females deposit eggs in clusters on host trees, chiefly in sheltered locations. Each egg mass contains about 115 eggs. Larvae appear in July and begin feeding. The young larvae are very active and spin threads by which they are blown from tree to tree. Older larvae migrate from host to host. There are five larval instars in a period of about 45 days. Pupation occurs in the fall in cocoons spun between fallen leaves or under debris. The winter is passed in the pupal stage.

*Also called hopdog and pale tussock moth

(Lymantriidae, Lepidoptera)

Description: ADULT - Wing expanse 38-60 mm., female larger than male. Forewings whitish-gray, with two dark cross lines and dark-flecked fringe. Hindwings dirty-gray with washed-out bar. Body reddish-white or grayish in front, white behind. LARVA - 40-45 mm. long, greenish-yellow with black cross bars, yellow brushes on fourth to seventh segments, eighth segment with a red hair-pencil. This latter character distinguishes this species from related lepidopterous larvae and permits ready identification under field conditions. PUPA - Brownish, abdomen reddish-brown, clothed with yellow hairs, in silken cocoon. (Prepared in Survey and Detection Operations in cooperation with other ARS agencies). CEIR 9(47):11-20-59.



Figures of Dasychira pudibunda: Adults, Larva, Egg, Pupa, Cocoon

INSECTS NOT KNOWN TO OCCUR IN THE UNITED STATES

SPRUCE BARK BEETLE (Ips typographus L.)

Economic Importance: This bark beetle is considered to be one of the most destructive pests of spruce on the continent of Europe. Extensive injury to forests, resulting from wars, fires and storms, has at numerous times made possible the buildup of high populations of the pest which caused excessive secondary damage. Observations in Sweden in 1932, following storms, showed a peak abundance of 520,000 beetles per acre in spruce forests. In addition to damaged trees, this species also attacks healthy trees. The capacity for breeding in very fresh bark, coupled with the habit of continuing to feed in the bark on completion of development, makes the insect a serious pest of spruce forests. Ips typographus prefers thick, succulent bark, but will adapt itself readily to bark of different thicknesses and generally prefers parts of the tree more than 3 feet from the ground. A very similar Ips beetle, recorded as I. t. japonicus Niiij., is known to occur in Japan, Korea and the Soviet Far East, but is generally regarded as a subspecies of I. typographus.

Distribution: Recorded in most of Continental Europe, USSR and Korea. Ips t. japonicus is recorded in Japan, Korea and the Soviet Far East.



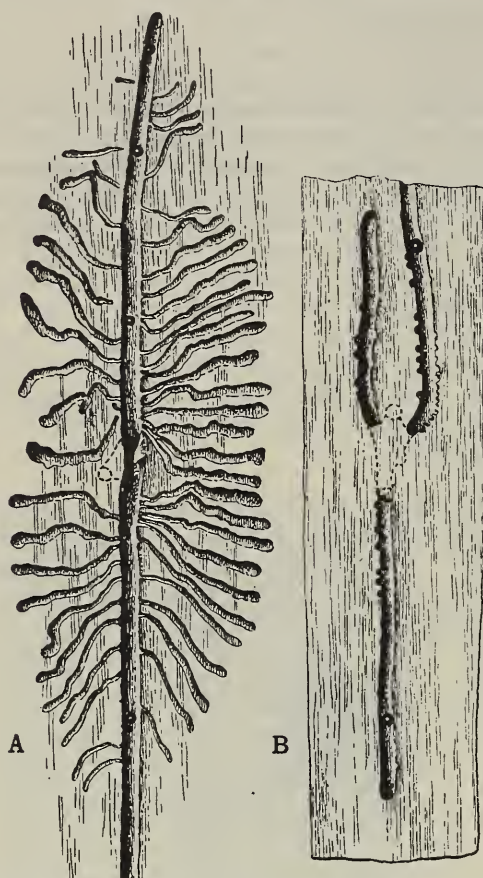
General Distribution of Ips typographus

Hosts: Prefers spruce, but will attack pine and other conifers.

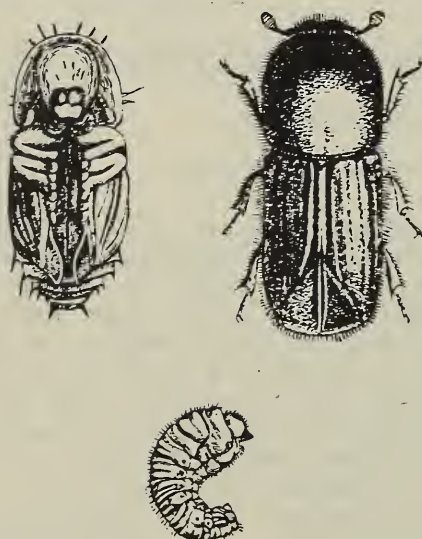
Life History and Habits: In Germany, breeding begins in early spring, the date varying according to weather conditions. Eggs are laid at regular intervals in egg-pockets along the sides of egg-galleries. Egg laying often requires 3 weeks or more, larvae from the first-laid eggs being half grown before the last eggs are laid. Frequently the larvae, pupae and young adults are present in the same brood system. Under normal conditions, parents may produce 2 successive broods during the same year, the first brood developing in 2 or 3 months, the second maturing before winter. If, however, the second brood cannot mature before winter, development is completed the next spring. The sex ratio of Ips will vary according to the species, the normal being 2 or 3 females per male in I. typographus. The egg-galleries of Ips are fairly constant in pattern and to some degree may indicate the species present (see illustration). I. typographus normally constructs a 3-armed gallery system with egg-galleries starting from a central pairing chamber. The galleries extend about 5 inches, invariably directed to the long axis of the trunk. Larval tunnels seldom exceed $1\frac{1}{4}$ inches in length. Egg-galleries may vary from the general pattern, however, depending on population, and on whether attack is on felled or standing trees.

(Scolytidae, Coleoptera)

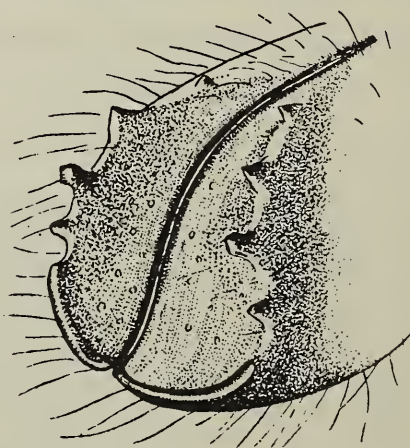
Description: Adults are dark brown, almost black. The front of head covered with long yellowish hairs and small granular tubercles; club of antenna flattened and almost circular, slightly narrower near tip. Sutures of club strongly arched or curved. The prothorax longer than broad, very rough and wrinkled in front and sides; finely punctured behind on each side of a smooth impunctate central line. Front and sides of prothorax thickly clothed with long yellow hairs; central rear portion without hairs. Elytra about one and one-half times as long as combined width. Striae on each side of elytra on upper portion deep and strongly punctured, becoming wider towards the apical declivity; elsewhere striae very shallow and regular. Front edge and sides of elytra with hairs, becoming dense along sides. Apical declivity strongly excavated; extending to about one-third of each elytron; a central depression along suture or central line, extending halfway along entire length. Apical declivity bounded on each side by raised margin bearing four distinct teeth, third tooth from top the largest. Characteristically dull, matt surface of silky luster, fine irregular punctures and hairless except along margins and narrow, upper portion. Total length 4 to 5½ mm. Mature larvae thickset, white, legless with light brown head and mandibles. About 5 mm. in length. (Prepared in Survey and Detection Operations in cooperation with other ARS agencies.). CEIR 9(8):2-20-59.



Galleries of I. typographus, Showing Larval Tunnels (A) and Egg-pockets as Indicated by Pips (B). Copulatory Chamber Outlined.



Stages of Ips typographus



Apical Declivity of Ips typographus

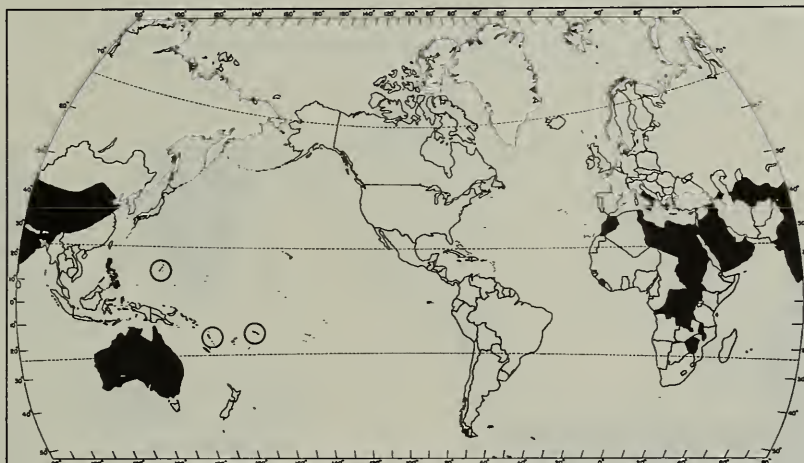
Figures (except map): Larva, pupa and adult from Tashenberg, E. P. 1884. Die insecten, tausendfussler und spinnen. Brehms Thierleben Allgemeine Kunde des Thierreichs. 2nd. Ed. Vol. 1 (Leipzig) 711 pp. Apical declivity from Balachowsky, A. 1949. Faune de France, Coleopteres, Scolytides. 320 pp., Paris. Galleries from Boas, J. E. V. 1923. Dansk Forstzoologi. 763 pp., Copenhagen.

INSECTS NOT KNOWN TO OCCUR IN THE UNITED STATES

A NOXIOUS MUSCID FLY (Musca sorbens Wiedemann)*

Economic Importance: This muscid is of considerable importance to the welfare of man and animals in the Ethiopian and Oriental regions. It is an important vector in the transmission of protozoan and bacterial diseases including dysentery, yaws, tuberculosis, trachoma, conjunctivitis, typhoid fever, etc. Musca sorbens is generally considered to be one of the primary filth flies in Guam and some other islands in the Pacific. It is very persistent in attempts to feed on open sores or wounds and will often fly into the mouth, nostrils, eyes or ears. The healthy flesh around the wounds, in corners of eyes, mouth, and around the vulva of cattle and horses in Australia will sometimes appear eaten away, leaving cavities. Animals may become so badly affected during the fly season that they may have to be destroyed. In Nyasaland it was found that 95 percent of the flies that frequent man were M. sorbens, being especially attracted by the odor of sweat on the unclean natives.

Distribution: Occurs in many areas of Africa, Asia and Oceania. It has been recorded in Egypt, Sudan, S. Rhodesia, Nyasaland, Uganda, Morocco, Tunisia, Libya, Belgian Congo, Sierra Leone, Saudi Arabia, Jordan, Aden, Iraq, India, USSR (Azerbaijan, Tadjikistan, Turkestan), North China, Philippine Islands, Australia, Guam, New Hebrides, Samoa and Italy.



General Distribution of Musca sorbens

Hosts: Attacks man and animals.

Life History and Habits: Life history and habits in Egypt are as follows: This fly is found more frequently outdoors than indoors, being fairly abundant in the country, in towns and open desert. Adult emergence is greatest between 5 and 8 a.m. during the summer. Emergence continues over period of 3-4 days in summer and 6-8 days in winter. A single female may lay up to 80 eggs, in 4 batches. The chief oviposition and breeding medium is human excrement and to a lesser extent, cow, buffalo and pig dung. (Horse dung also is preferred in Australia.) The species breeds year round with two peaks of season abundance; one in the spring and another late in the summer or in the fall. The fly is more abundant in districts with inadequate drainage system of sewage disposal. The life span at 24-30°C. averages about 21 days for the females and 18 days for the males. The females usually preponderate around breeding and feeding areas though the sex ratio is 1:1. The eggs hatch in about 6 hours

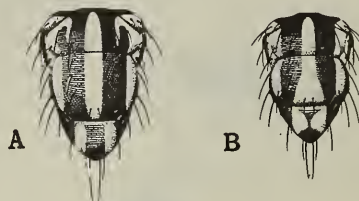
*Also known as the bush fly, Musca vetustissima, in Australia.
(Muscidae, Diptera)

under room conditions. The larvae pass through 3 instars, their duration being approximately 7, 14 and 40 hours at room conditions. The feeding larvae prefer humidities near saturation, while prepupating larvae prefer humidities with the range of 50-60 percent. Pupation takes place at varying depths in soil beneath the dung and lasts for approximately 6 days at 24°C. Humidity has no apparent effect on the pupa.

Description: Adult - antennae black; lower face and cheeks black with silky-white sheen. Frons deep-black with somewhat yellowish-white silky shining margins at eye cavities. Thorax grayish, almost submetallic shining with three white-shining stripes, the exterior stripes very broad, median stripe somewhat less broad, and in other direction appearing very distinctly gray on somewhat paler ground. Sides of thorax with white sheen, which forms nearly 2 oblique fasciae. Abdomen blackish with large yellowish-silky shining tessellation. Wings colorless, veins yellowish at base, halteres and squamae yellowish-white. Legs black. Length about 5-8 mm. Musca sorbens may be distinguished from M. domestica by the presence of two broad black thoracic stripes compared with four narrow stripes in domestica, the lateral, oblique, abdominal bands which extend from the anterior to posterior margins and the curvature of vein M-1 being greater than in domestica. Egg is pearly white, somewhat cylindrical with tapering anterior end. Length 1.6 mm; width 0.4 mm. Third-instar larva about 11.2 mm. long, posterior spiracles with 3 sinuous slits surrounded by D-shaped peritreme, the latter being much thicker than in M. domestica. Pupa is dark brown or chestnut, about 5.9 mm. in length; width 2.4 mm. (Prepared in Plant Pest Survey in cooperation with other ARS agencies.) CEIR 9(3)1-16-59



Adult of M. sorbens



Dorsal Surface of Thorax
of (A) female and (B) male
Adults of M. sorbens



Posterior Spiracles of Mature
Larva of (A) M. domestica
and (B) M. sorbens

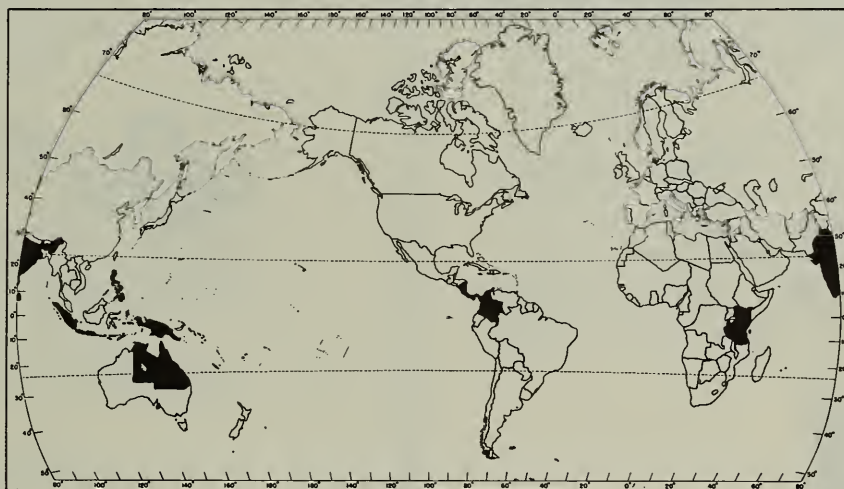
Figures (except map): Adult from Iyo Konchu Gaku (Medical Entomology) Vol. 2, pp. 1135-1136, 1943. (In Jap.) Dorsal surface of thorax from Smart, J. 1943. A Handbook for the Identification of Insects of Medical Importance. 269 pp., London. Spiracles of mature larva from James, M. T. 1947. U. S. Dept. Agr. Misc. Pub. 631, 175 pp.

INSECTS NOT KNOWN TO OCCUR IN THE UNITED STATES

A DRY-WOOD TERMITE (Cryptotermes dudleyi Banks)

Economic Importance: Termites of this genus are very destructive pests of hard, sound, dry wood in man-made structures such as buildings and furniture. Dry-wood termites are so-called because they feed on and live in dry wood. The name "domestic" is applied to several species of Cryptotermes since they are confined to man-made structures and do not compete with other dry-wood termites under "wild" conditions. In addition to C. dudleyi; C. domesticus (Haviland), C. havilandi (Sjöstedt) and C. brevis (Walker) are important species in various areas of the world. The latter species, C. brevis, has been recorded in the southern United States. The presence of dry-wood termites in structures is indicated by small heaps of frass or fecal pellets beside or below infested hardwood. An infested piece of timber removed for inspection will show galleries filled with frass. The frass is uniform in size, regular in shape, oval with concave surfaces and seed-like. Although the population of an individual dry-wood termite colony is small and can exist in a few cubic inches of timber, a high degree of damage is obtained by large numbers of colonies living close together.

Distribution: Recorded in Panama, Costa Rica, Colombia, India, Ceylon, Philippines, Indonesia (Sumatra, Java), New Guinea, Australia (Northern Territory, Queensland) and the East African Coast of Kenya, Tanganyika and Zanzibar.



General Distribution of Cryptotermes dudleyi

Hosts: Attacks dry hardwood of all types though some hardwoods such as west Indian mahogany, teak, mvule and belian are resistant for long periods before becoming susceptible to damage because of weathering or other factors.

Life History and Habits: Colonies of dry-wood termites are small, only a few hundred individuals in each colony, compared with thousands in a colony of a subterranean species. The colony consists of a king and queen, soldiers and nymphal workers. Each of these castes may ultimately become adults. Some nymphs never complete development and continue to work throughout their lives. Other nymphs become kings and queens, some with wings and some without wings.

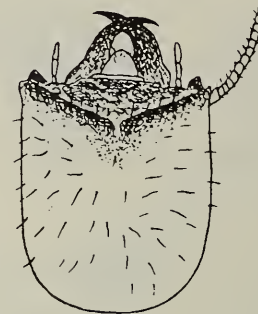
(Kalotermitidae, Isoptera)

Adults leave the colony in swarms, but in smaller numbers than subterranean type. Emergence occurs at frequent intervals in wetter climates. If a colony is detached, nymphs will mature without undergoing the normal number of molts. Fertile eggs are produced and the colony grows. A colony started by adults is quite hard to detect. Once inside the wood, they seal the entrance hole and do not eject refuse until the colony is under development. After a year or more, winged forms are produced and swarming takes place. With the change of many nymphs to adults and their subsequent departure from the colony, activity in the colony is slowed down for a time. Dry-wood termites are able to digest cellulose with the aid of enzymes in large protozoa which live within the gut. No contact with the ground is needed to obtain moisture or supplementary foods.

Description (after Banks): **SOLDIER** - Front of head and mandibles black, rest yellowish; front of pronotum dark; antennae very pale. Head enlarged in front; face with cavity, elevated in front, ridge obliquely sloping backward, not roughened above; from side, head nearly twice as long as high, black ridge little uneven or roughened; surface with scattered erect hairs. Mandibles long, evenly curved, toothed slightly on inner edge (see figure). Pronotum nearly twice as broad as long; deeply roundedly emarginate in front; surface with many short hairs. Length 5 mm. **WINGED** - Head pale reddish-yellow; abdomen and thorax yellowish; antennae and legs paler. Eyes nearly circular, near lower margin of head; ocelli small, close to eyes. Pronotum nearly twice as broad as long, sides evenly convex, front margin concave. Scattered fine hairs on head and thorax. Radial sector of wing with several oblique branches near tip, median vein runs into radial sector about three-fourths way to tip. Length 10 mm. (Prepared in Survey and Detection Operations in cooperation with other ARS agencies and the U. S. National Museum). CEIR 9(22):5-29-59.



Soldier and Winged Adult
of Cryptotermes dudleyi



Head, Pronotum and Mandibles
of Cryptotermes dudleyi

Figures (except map): Soldier and adult from Harris, W. V., 1958. East Afr. Agr. Jour. 23(3):161-166. Head, pronotum and mandibles from Banks, N., 1918. Amer. Mus. Nat. Hist. Bul. 38(17):659-667.

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1957 List

APPLE SUCKER (*Psylla mali* Schmidberger)
 ASIATIC RICE BORER (*Chilo suppressalis* (Walker))
 BALUCHISTAN MELON FLY (*Myiopardalis pardalina* (Bigot))
 BEAN FLY (*Melanagromyza phaseoli* (Coquillett))
 BEE MITE (*Acarapis woodi* Rennie)
 BEET BUG (*Piesma quadratum* (Fieber))
 BEET SAWFLY or TURNIP SAWFLY (*Athalia colibri* (Christ))
 BEET WEEVIL (*Cleonus punctiventris* Germ.)
 BUFFALO FLY (*Siphona exigua* (De Meijere))
 CHAFER (*Melolontha melolontha* (L.))
 COTTON JASSID (*Empoasca lybica* (Bergevin))
 COTTON PLANT BUG (*Horcias nobilellus* (Berg))
 CUCURBIT BEETLE (*Diabrotica speciosa* Germ.)
 DESERT LOCUST (*Schistocerca gregaria* (Forsk.)
 DURRA STALK BORER (*Sesamia cretica* Led.)
 EGYPTIAN COTTONWORM, TOMATO CATERPILLAR or
 TOBACCO CATERPILLAR (*Prodenia litura* F.)
 GARDEN CHAFER (*Phyllopertha horticola* (L.))
 HUMAN BOT FLY (*Dermatobia hominis* (L., Jr.))
 LEAF-CUTTING ANT (*Atta sexdens* (L.))
 LIGHT-BROWN APPLE MOTH (*Austrortrix postvittana* (Walk.))
 MAIZE STALK BORER (*Busseola fusca* Fuller)
 NUN MOTH (*Lymantria monacha* L.)
 ORIENTAL BLACK CITRUS APHID (*Aphis citricidus* (Kirkaldy))
 PADDY BORER or RICE STEM BORER
 (*Schoenobius incertulus* (Walk.))
 PINE LAPPET (*Dendrolimus pini* L.)
 QUEENSLAND FRUIT FLY (*Dacus tryoni* (Frogg.))
 RUTHERGLEN BUG (*Nysius vinitor* Bergroth)
 SENN PEST (*Eurygaster integriceps* Puton)
 SPINY BOLLWORM (*Earias insulana* (Bdv.))
 TOBACCO STEM BORER (*Gnorimoschema heliopa* (Lower))
 TURNIP GALL WEEVIL (*Ceutorhynchus pleurostigma* (Marshall))
 TURNIP MOTH (*Agrotis segetum* (Denis and Schiffmuller))
 VINE MOTH (*Lobesia botrana* (Schiff.))
 WHEAT BULB FLY (*Hylemya coarctata* Fallen)
 WINTER MOTH (*Operophtera brumata* (L.))
 YELLOW PEACH MOTH (*Dichocrocis punctiferalis* Guen.)

1958 List

APPLE CAPSID (*Plesiocoris rugicollis* (Fallen))
 APPLE THRIPS (*Thrips imaginis* Bagnall)
 ASPARAGUS FLY (*Platyparea poeciloptera* Schrank)
 BANDED PINE WEEVIL (*Pissodes notatus* F.)
 CABBAGE MOTH (*Mamestra brassicae* (L.))
 CABBAGE-STEM FLEA BEETLE (*Psylliodes chrysocephala* (L.))
 CELERY FLY (*Acidia heraclei* L.)
 CHESTNUT WEEVIL (*Curculio elephas* (Gyllenhal))
 CITRUS LEAF MINER (*Phyllocnistis citrella* Stainton)
 COTTON STEM WEEVIL (*Pempherulus affinis* (Faust))
 COMMON CRANE FLY (*Tipula oleracea* L.)
 EUROPEAN CHERRY FRUIT FLY (*Rhagoletis cerasi* L.)
 FRUIT WEEVIL (*Rhynchites heros* Roelofs)
 GREEN OAK TORTRIX (*Tortrix viridana* L.)
 LACKEY MOTH (*Malacosoma neustria* L.)
 LARGE WHITE BUTTERFLY (*Pieris brassicae* (L.))
 A LEAF BEETLE (*Lema melanopa* L.)
 A LEAF-FEEDING COCCINELLID (*Epilachna paenulata* (Germar))
 LEMON BUTTERFLY (*Papilio demoleus* (L.))
 LUCERNE-FLEA (*Sminthurus viridis* Lubbock)
 PEA THRIPS (*Kakothrips pisivorus* Westwood)
 PEACH FRUIT MOTH (*Carposina niponensis* Walsingham)
 PEAR SAWFLY (*Hoplocampa brevis* (Klug))
 PHILIPPINE COTTON BOLL WEEVIL (*Amorphaidea lata* Motschulsky)
 PINE MOTH (*Panolis flammea* (Dennis & Schiffmuller))
 PLUM FRUIT MOTH (*Laspeyresia funebrana* (Treitschke))
 PUMPKIN CATERPILLAR (*Diaphania indica* (Saunders))
 RASPBERRY MOTH (*Incurvaria rubiella* (Bjerkander))
 RED-LEGGED EARTH MITE (*Halotydeus destructor* Tucker)
 RED BOLLWORM (*Diparopsis castanea* Hampson)
 RICE HISPID (*Dicladispa armigera* (Olivier))
 SILVER-Y MOTH (*Autographa gamma* (L.))
 SOUTH AMERICAN BOLLWORM (*Sacadoses pyralis* Byar)
 SOYBEAN POD BORER (*Grapholitha glycinivorella* (Matsumura))
 TURNIP FLEA BEETLE (*Phylliodes chrysocephala* (L.))
 VIOLET LEAF MIDGE (*Dasyneura affinis* (Kieffer))

Note: Pumpkin caterpillar (*Diaphania indica*) was recorded in Florida in 1959. See CEIR 9(47):1012 for details

